THE METAL INDUSTRY

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STEPPING STONES TO SUCCESS IN THE FOUNDRY.

The fact cannot be emphasized too often that on account of the complex nature of the mixture of metals which are used in the manufacturing of the various non-ferrous alloys, succes can only be obtained and retained at the price of everlasting watchfulness and of paying strict regard to keeping the conditions of working as uniform as possible. In order to obtain the very best possible results, regard has to be paid in the first place to the question of accurate weighing out of the various ingredients. A good deal of trouble occurs on that account, and it is hardly ever suspected that this is the cause. The use of miscellaneous scrap is another matter which has cost the loss of many a casting. It is hardly conceivable that founders who want to do good work should be willing to endanger the operations and to risk the loss of a good deal of material by buying cheap scrap of a composition, of which as little is known to themselves as well as to the seller of the material. Yet such is frequently the case, and when trouble occurs, as it frequently does, it may happen, that the melter is blamed for the defect castings that are turned out, where he really had done the best he could under any circumstances.

Another matter to which strict regard has to be paid, is that of melting as quickly as possible, after bringing the alloy gradually to a red heat. It is well known that the various metals used in the manufacture of the non-ferrous alloys have a great tendency to absorb oxygen, with consequent deleterious influences upon the properties of the resulting alloys. Furthermore if the melting is conducted too slow, or if it is conducted at too high a temperature, the loss by volatilization will be quite considerable and will result in a pecuniary loss to the proprietor of the establishment which could easily have been avoided. If the proper care and forethought are used in this matter, much can be accomplished in reducing the loss by volatilization. An instance of that loss is seen in the analysis of an alloy in which the melter aimed at getting a composition of 88 copper, 10 tin and 2 zinc, but in which by analysis no zinc could be detected, showing that all of that metal had been burned off.

In regard to the influence of the casting temperature, it is only necessary to draw again the attention of the brass founders to the results obtained by Mr. P. Long-

muir, and published in the May and June issues of THE METAL INDUSTRY. The deleterious influence which is exerted by either too high or too low a casting temperature is so convincingly shown in these experiments that anyone who runs may read and that further comments are unnecessary. There is no doubt that an incorrect casting temperature is at the bottom of a good deal of the troubles which are experienced in the variation of the mechanical properties of alloys, and definite data as to its influence, such as those obtained by Mr. Longmuir, will go a long way towards recalling the attention of the foundrymen to the subject.

CURRENT DENSITY IN PLATING OPERATIONS.

In modern formulas for plating baths there appears a factor which was not given formerly, viz., the current density. This term is not as sufficiently known among electroplaters as it deserves. The word "current density," as mentioned before in these columns, signifies the amount of current in amperes per unit surface of articles in the bath, which current has been found by experimenting with a particular formula for the composition of the bath to give the best results for the deposition of the metal. The figure as usually given, when expressed in English units of measurement, signifies the amount of current to be used for each square foot of electrode surface. In those countries which employ the metric system of measurement, it is usually given in amperes per square decimeter or per square meter. The two values, of course, can be easily converted into each other, inasmuch as one square meter equals 10.764 square feet and one square foot equals 9.29 square decimeters. Consequently, when the current density for a particular bath is given as, say, one ampere per square foot, and if the total surface of wares hanging in the bath is, say 100 square feet, the volume of current which should be used with that amount of surface and which gives the best results for that particular formula for which it is given, will be 100 amperes. If the current density were given, for instance, as 0.3 amperes per square decimeter, this would mean $0.3 \times 9.29 = 2.787$ amperes for each square foot, or for 100 square feet, as in the preceding example, 278.7 amperes.

It is, of course, immaterial as far as the current density is concerned what voltage is employed, inasmuch as the term of current density has only reference to the volume of the current or the amperage. Thus the amperage of the current is to be proportioned to the amount of surface of the wares in the bath and the voltage has to be regulated, that is, decreased or increased, to suit. An ampere meter, of course, has to be in the circuit, so that the amount of current flowing through the bath can be controlled. Many platers use baths, which they have found by experience to give the best results, and by measuring the current and proceeding in the manner outlined above they will soon find what particular current density is best suited for their purpose. They will thus be able to get exactly the same conditions in each operation, and therefore exactly the same results, and the chances for turning out unsatisfactory work will be largely diminished. There is no doubt that the measurement of the current density, as it offers such an easy means of exactly controlling the plating operation, will in the near future be much more extensively adopted among electro-platers.

THE FOUNDRYMEN'S CONVENTION.

The American Foundrymen's Association held a most successful convention in New York City June 6th-8th. There were 275 members present and all were very well taken care of by the managing officers of the association. A special feature at this year's meeting was a day spent at Columbia University, which put the proceedings on a higher intellectual plane than when held in the ordinary business conventon hall. The University is situated on Morningside Heights, in the northern part of the city, amid the finest surroundings, and in the lecture rooms there was every facility for the presentation and illustration of the various papers.

Besides the convention of the American Foundrymen the Associated Foundry Foremen held their third convention in connection with the association, which brought the active workers in the foundry field in touch with the superintendents and owners. The headquarters of the Foundrymen was the Murray Hill Hotel, and the first day's session was held at the Grand Central Palace, but a few blocks away from the headquarters. The next day, Wednesday, the members went to Columbia University, spending the entire day there and taking lunch at the University Commons. On the last day, Thursday, the business session in the morning was held at the Grand Central Palace, and in the afternoon the members visited the new works of the International Steam Pump Company at Harrison, N. J.

The election of officers for the ensuing year was as follows: President, Thomas D. West, of Sharpsville, Pa., of the Thomas D. West Foundry Company; secretary and treasurer, Dr. Richard Moldenke, Watchung, N. J. This is the fifth year that Dr. Moldenke has been elected to this office. Vice-presidents of the several geographical districts are as follows: Harry A. Carpenter, A. Carpenter & Sons, Providence, R. I.; H. VanAtta, J. L. Mott Iron Works, New York; A. V. Slocum, National Car Wheel Company, Pittsburgh, Pa.; A. K. Beckwith, P. B. Beckwith, Dowagiac, Mich.; David Spence, Greenbar Foundry Company, Chicago, Ill.; Adam Bair, Chicago, Milwaukee & St. Paul R. R.; J. P. Golden, Golden Foundry and Machine Company, Columbus, Ga.; T. J. Bert, Warden, King & Co., Montreal, Province Quebec. For the Foreman's section: David Reed, chairman; F. C. Everitt, secretary. Metallurgical section, R. S. MacPherran, chairman; H. E. Diller, secretary. Pattern Makers section, J. H. McCaslin, chairman; William H. Parry, secretary.

The establishment of a Brass section in connection with the various other sections was discussed with interest by the various members, and it was thought advisable to start such a section as soon as the officers for it could be selected. The association decided to meet at Cleveland next year.

COPPER REFINERY PLANT FOR MARTIN'S DIRECT ROLLING PROCESS.

By H. J. Martin, Swansea.

The salient feature in the direct rolling process for the manufacture of copper, as described in The Metal Industry, Volume 1, page 95, consists in the utilization of the heat still contained in the copper cakes or wire bars immediately after they are ladled and become solidified in the refinery. Special tipping molds are used for facilitating the rapid removal of the hot cakes or bars therefrom, the inherent heat being immediately utilized for performing the roughing or breaking-down rolling operation direct from the refinery, instead of from heating furnaces as is now obligatory. If deemed advisable for a run of work of the same size the second rolling stage or "drawing on" is also carried out by means of this same heat. In other cases, however, it may, perhaps, be found preferable to fully accomplish only the first rolling operation and then to allow the plates to cool down, inspecting and removing any defects before shearing and finishing them. It will be seen that considerable economy must be effected by doing away with so much of the reheating now necessary, with all its attendant disadvantages and risks. Among the various advantages claimed for the process one of the most important is the avoidance of porosity in the product (which shows itself as blow holes, pin holes, piping or cold sets) and the consequent production of greater soundness in the metal. The great pressure which the metal is subjected to by direct rolling whilst it is still in a soft and semi-plastic state has the effect of bringing about the elimination of the above named grave defects by welding up the walls of any cavities and thoroughly consolidating the particles of the metal together.

Various arrangements may be adopted in the design of a copper refinery for carrying out the direct rolling process and for the application of the special tipping molds which are necessary for facilitating it. Moreover, advantage would be taken of the benefit and economy to be derived by adopting the system of tapping from the furnace, for all the larger masses of copper, and thus doing away with the tedious and laborious operation of hand ladling, which at times becomes intolerable. One of these arrangements provides for the use of a large portable ladle, which is filled intermittently from the taphole and handled by a crane for the purpose of pouring into fixed molds. Another arrangement consists in the use of a big stationary ladle anchored in a permanent position under the tap-

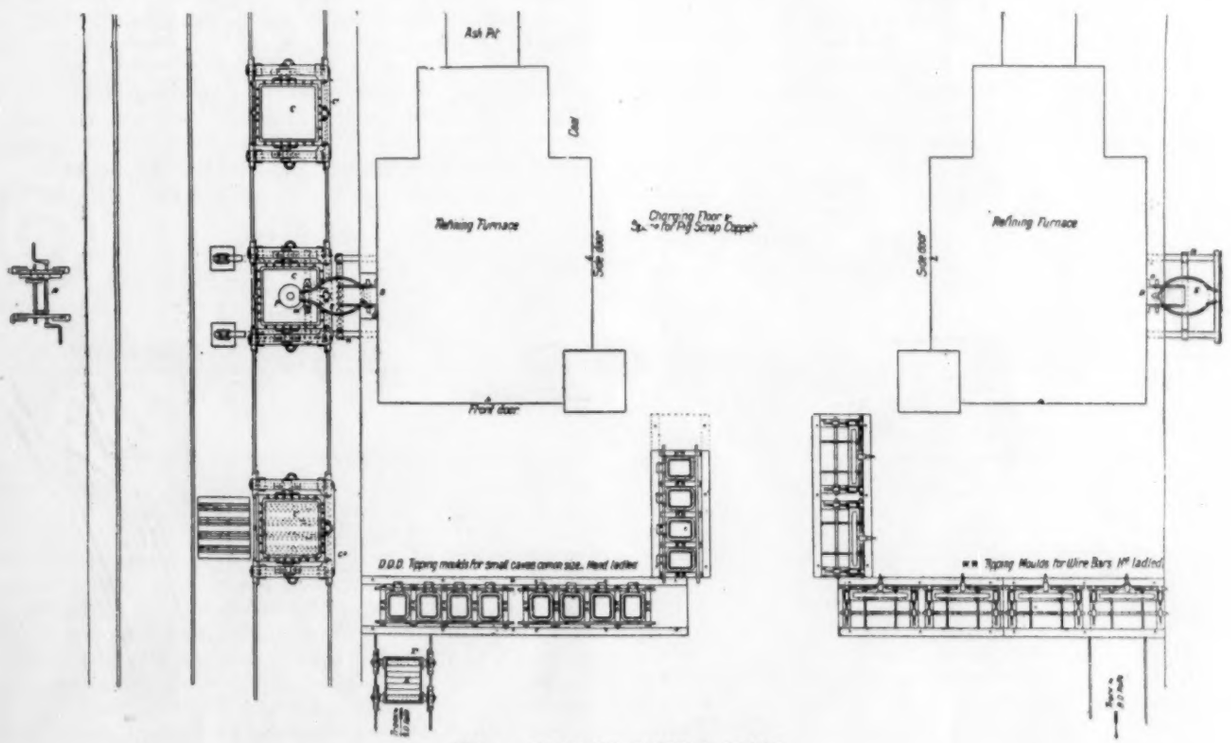


FIG. 1. PLAN OF CASTING PLANT.

hole spout. The flow of the metal from the taphole into the ladle is continuous and the pouring operation from the ladle into the molds is intermittent as desired by the operator. As these large molds are mounted on cars or bogies, and thus movable, they are run up under the lip of the ladle for receiving the molten metal.

About the simplest form of procedure on the latter principle, which is undoubtedly the better, and the one recommended and described in the following, is shown by the arrangement in the adjoining plan and elevations of the refinery plant, Figs. 1, 2 and 3. This arrangement shows the casting pit, the ladle, the tipping molds and the general appliances in connection with them. The arrangement may be very easily applied to existing furnaces, and at the same time it possesses the advantage of enabling the whole of the casting operations to be performed by manual

labor, so that the installation of mechanical power in the refinery may be dispensed with if not desired.

It will be seen by observing the plan, that it is proposed to still carry on the present system of hand ladling from the front door A for all small masses of copper such as common cake, into the small special tipping molds V or in the case of light wire bars into the molds W. These can perhaps be turned out much cleaner and without splashing, etc., in this way than by mechanical means. But all the larger masses of copper, such as big cakes and heavy bars, would be poured from a big ladle, which would itself be filled by a regulated and continuously flowing stream from the taphole B in the furnace side. The large spoon-shaped ladle E is in a fixed position underneath the taphole spout. It is anchored at its front and exactly underneath the lip in the suspended bearings M. These act as a fulcrum in which the ladle turns and when it is desired to pour from the ladle into the large movable molds C, the big end of the ladle at O is merely lifted by means of a wire rope and a sling suspended from a sheave and attached to a winch. Preferably, if hydraulic power be available, the rope is attached to the piston of a hydraulic cylinder. When in the act of pouring, the level of the metal in the mold has reached the mark indicating the correct thickness for the cake, the back end O of the ladle is at once lowered and the pouring stopped. The still running stream of metal would now go on replenishing the ladle for the next cake and in the meantime, while the ladle is filling again, the mold which has just been filled is moved on towards the tipping place and another empty one brought in to take its place under the lip of the ladle. If more metal should be required for an extra thick cake then a full ladle would hold, the back end of the ladle is merely kept up for awhile after being emptied, and in that case the stream from the taphole would be directed over the inclined lip straight into the mold. When the necessary supplementary quantity has run in, the pouring is instantly stopped by lowering the ladle onto its rest N. Thus the hottest metal is gotten into the cake right up to the very last.

It will be obvious that by the above arrangement the molten copper in the large ladle would be constantly receiving a fresh relay of heat above the melting point temperature from the continuously flowing fresh stream from the taphole. In this manner the congealing or chilling of the copper would be prevented and this was formerly one of the greatest difficulties met with in tapping metallic copper from furnaces. This desideratum may be further insured by a cover of charcoal in the ladle if necessary. It will be seen by observing the plan that the position of the lip of the ladle scarcely is altered at all during the movements of lifting and lowering the back end, on account of the fact of its being anchored and turning on the center N immediately underneath. Thus the fall of the metal from the lip scarcely ever varies and, as it is nearly always constant, is very small and thus avoids much splashing, etc. The metal may be poured either directly from the lip into the mold C, or if found preferable and in order to preserve as unruffled a surface as possible it may be first poured into the funnel at F. The latter is provided with a baffle plate at its bottom, which causes the stream to be gently distributed to all points of the mold until it is up to the mark. The metal may be thus poured in a larger body and cold sets may be avoided which by the old system of hand ladling are so liable to occur, when casting and "floating" these large cakes, in consequence of the large area exposed. This is also due to the fact that the metal in the mold is only augmented by such small quantities as the ordinary hand ladle contains.

The weight of the large ladle with its contents, when lowered and at rest, is supported by the T bar M which is hung from the I beams above and from which the stanchions or hangers with the bearings M at their extremities are also suspended. Each large mold after being filled from the big ladle and allowing a short interval of rest for the formation of a crust, is at once moved along to a spot over a heavy dumping plate G. Here the mold is tipped by simply giving it half a turn by means of an overhead or jib crane, when the hot cake drops out onto the plate G as shown at X. From this plate it would be lifted with as little delay as possible onto the mill car K, which runs on a short rail track, as indicated by the arrows, straight to the breaking-down rolls. The latter are in close proximity and the rolling of the cake will be immediately proceeded with, taking advantage of the inherent heat still left in it from its original molten condition in the refinery. The empty car with its mold, which has just been tipped, is in the meantime transferred to the other track in the casting pit and run back again to the position marked C_1, where it is held in reserve, and ready to be run under the lip of the ladle. Car C_2 is already shown in that position where the pouring operation is at once effected, and the preceding car, with its mold previously filled, has been moved on and is shown over the dumping plate at the place for tipping. Thus the procession would go on as long as necessary, only 3 cars being absolutely required, as they might be used over again. One of the most essential features in the use of these bogies is their perfect freedom and independence of movement as compared with the arbitrary motion of mechanical appliances. In the case of any interruption in pouring through mishaps or delay in manipulating the cars or perhaps a block in either of the operations from whatever cause, the ladle perhaps in the meantime becom-

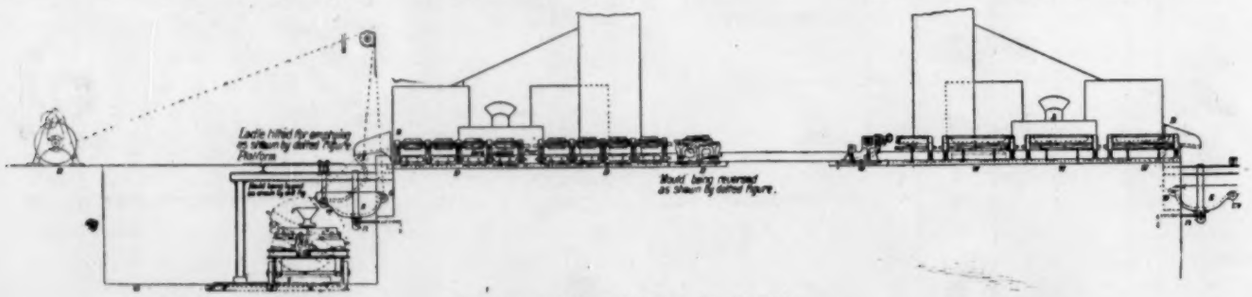


FIG. 2. CROSS SECTION OF PLANT..

ing filled up, the flow from the taphole may be easily checked for awhile or stopped altogether by the furnaceman in charge.

The smaller or common cakes, etc., would as stated before, be ladled by hand as usual from the front door of the furnace at A into the small special tipping molds V or light wire bars into molds as shown at W, from which they would be readily tipped by simply giving them half a turn by hand, when the cake would drop out onto a small stool underneath. The cake mold would thus be reversed and be ready to receive another cake on its upper side. Thence, whilst still hot (instead of from a heating furnace as now necessary), the cake would be withdrawn over the roller Z by means of tongs onto a light hand car, in order to be conveyed without delay to the breaking down rolls by the rollerman's assistants, who would now be saved any trouble of looking after and attending to the heating furnaces. For tipping the large molds C and also lifting the heavy cakes out of the pit from the plate G onto the mill car K, an ordinary jig crane with a rocking top block might be used. By the installation of an overhead traveling crane, however, for doing the work just mentioned, this crane might also be made to command the smaller molds B and W, and the changing of the latter to suit various requirements would also be facilitated, inasmuch as the same bed plates are made suitable for most of the

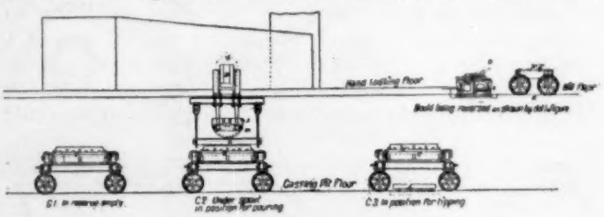


FIG. 3. ARRANGEMENT OF MOLDS.

smaller molds, i. e., for common cake molds, wire bar molds also bar ingot molds. All of these being readily tipped by hand, the impact of the mold striking on the cross-bar when reserving or tipping, would tend to loosen the cakes or bars, should any of them have a tendency to stick. Of course the usual preparatory wash of wood or bone ash or charcoal as well as a slight taper in the mold sides also facilitates this operation. The large and the small cake molds are in addition provided with bottom plates of copper, which have the effect of producing castings far more perfect in character and much freer from pin holes, etc.

As all the large cakes or bars before mentioned would be produced by tapping from the furnace and not by hand ladling, they would almost entirely be used in the new method for the bulk, if not for the whole of general mill work, as they may be broken down and sheared to suit either large or small requirements. Thus small cakes or light wire bars requiring hand ladling might be almost abolished or only be made for special requirements. On account of this, hand ladling from the front door of the furnace need only be carried on for a small proportion of the refining furnace charge, thus reducing this tedious operation to a minimum.

The advantages which may be derived by the use of the above refinery plant alone are summarized below and are quite independent of the further important ones which have been enumerated elsewhere attendant upon the adoption of the direct rolling process. The latter would be employed in conjunction with the plant or not, as may be expedient and according to whether the refinery products are to be marketed as such or are to be further manufactured. In the latter case the importance of immediately direct rolling them will be obvious inasmuch as the hot cakes are turned out by this plant ready to hand. Even with the old methods of manufacture, however, the use of this plant would be advantageous. The advantages derived by a refinery plant arranged as described above are as follows:

1st. Great reduction of time in casting all the large masses of copper, by doing away with the hand ladling of the same by tapping from the furnace and pouring from a big ladle, at the same time enabling either of these means to be carried out from the furnace, as may be found desirable for any particular product.

2nd. Prevention of chilling or setting of copper in the ladle by a continuous flow of molten metal at a high temperature into the same, without interfering with the proper control necessary for starting or stopping the operation of pouring into the molds.

3rd. The amelioration to a very large extent of the present trying conditions for the workmen in carrying out the usual tedious, laborious and hot work.

4th. Enabling all the operations to be performed by manual labor and thus obviating the installation of mechanical power in the refinery if not desirable. Also the molds are all self contained and the present labor of putting them together and taking them apart again after the casting, is done away with.

5th. Freedom and independence of movement of the bogie cars over mechanical appliances, between the different stages of the casting operation, and the provision of storage room between the different positions.

6th. The furnace charge of cakes, plates, or bars being available on the same day instead of one the next as at present.

7th. Prevention of coldsets, etc., on account of being able to pour in a larger body into the large molds and thus filling them more rapidly.

8th. The molds being so constructed as to be suitable for at once tipping the hot cakes therefrom and thus enabling direct rolling, with its further advantages, to be accomplished or not as is deemed expedient. most expedient.

THE PRODUCTION OF GOLD IN THE UNITED STATES IN 1904.

According to Mr. Lindgren, of the U. S. Geological Survey, in a recent bulletin of the survey, the production of gold in the United States during 1904 amounted to $84,551,300. This figure shows a considerable rise over that for 1903, which was only $73,591,700. The sources of this increase are easily traceable, inasmuch as they are due in the first place to the increased activity in Cripple Creek after the settlement of the labor troubles. This resulted in an increased production of about $3,000,000. In the second place, it is due to the newly discovered district of Goldfields, in Nevada, which added an output of $1,500,000, and in the third place, owing to the wonderful increase of the dredging business in the State of California, the production of the latter State increased about $3,000,000. Utah also showed a gain of about $1,000,000, due to the development of auriferous copper ore smelting in that State. Moderate gains were also made in Alaska, Montana and South Dakota.

SILICON COPPER IN THE BRASS FOUNDRY.

By W. J. Reardon.

Silicon copper is one of the various products for which modern metallurgy is indebted to the advent of the electric furnace. It is a well-known fact that the metal silicon is a very active deoxidizer and its use is not attended with the various disadvantages possessed by other deoxidizing agents. In the accompanying illustration (Fig. 1), there are shown two fractures of silicon copper ingots. No. 1 is that of a 20 per cent. silicon copper alloy, while No. 2 shows half an ingot of 10 per cent. silicon copper.

NO. 1. NO. 2.

FIG. 1. SILICON-COPPER INGOTS.

The use of silicon has made the much desired and talked of solid copper castings no longer a mystery but a pleasant reality. By employing it in comparatively small amounts it is possible to produce solid copper castings free from pipes and blow holes with as much regularity as castings in bronze or brass. This fact is demonstrated by the reproductions of two copper castings shown in Fig. 2. No. 2 shows a casting of pure copper without the use of silicon. It is easy to be seen that the metal in the head of the casting has raised up instead of shrinking. Consequently the casting beneath the head will be found full of blow-holes and the metal will be very porous. In No. 1, on the other hand, the head of the casting shows a certain amount of shrinkage. The casting reproduced in No. 1 was made by adding one pound of 10 per cent. silicon copper to 100 pounds of pure lake copper. When the head is cut off, the casting beneath the head will be perfectly solid and free from blow-holes.

The manufacturer of copper castings has always been filled with a certain distrust and uneasiness, until his castings had been chipped and cleaned and were ready for shipment, inasmuch as there is no certainty as to where the casting will pipe. A very small quantity of foreign matter exerts a great influence upon the properties of copper and those of its alloys. On account of its great conductivity and tenacity the uses for pure and unmixed copper are various and important. In the electrical manufacture, for instance, it is of the utmost necessity to produce solid copper castings, which should show a high electrical conductivity. Formerly, on account of the extreme difficulty of securing good strong castings with a high conductivity, rolled copper in bars or forged into coils, etc., and at a much higher cost, had to be used. It is also, of course, of the greatest importance to produce solid castings, and for this purpose various metals, such as zinc, tin and phosphorus have at times been alloyed with the copper.

However, the great difficulty found in alloying these metals with the copper was, that when a sufficient amount of them was put in so as to produce solid castings, the elongation and the conductivity of the castings would drop way down. Thus a pig of ingot copper which would show a conductivity of 90 per cent. and an elongation of 50 per cent. would, in the castings show only about 45 per cent. conductivity and 6.47 per cent. elongation. Now, however, with the aid of silicon copper, it is possible to produce a casting free from blow-holes and pipes with an electrical conductivity as high as that of the ingot. This fact is being demonstrated daily by the writer.

Silicon is not only the surest and safest deoxidizer and flux for copper, but it can be used very effectively in brass and bronze. The writer has had fifteen years' experience in work that was required to stand a strong air and water pressure, and he has had a hard time on various occasions explaining why castings that looked good and clean to the eye and machined perfectly would not stand the pressure. Various theories were advanced as to the cause, such as too free use of scrap, castings too light, not of uniform thickness, pouring temperature not right, etc. The writer made a number of experiments and found that not only copper, but other alloys, especially those rich in tin, when in a liquid state absorb oxygen and other gases very readily, and as those gases are given out again, solidification is rendered very difficult. Phosphorus can be used as a deoxidizer, but it discolors the castings and subjects them to a very low elongation. Silicon copper seems to be the very best agent to eliminate these troubles, and at the same time to hold up the elongation.

In cases where difficulties are experienced by foundrymen with castings that will not stand air or water pres-

NO. 1. NO. 2.

FIG. 2. CASTINGS OF PURE COPPER.

sure, the writer would advise them to try silicon copper judiciously. From his experience he has come to the conclusion that silicon copper properly used is the best deoxidizer and will help many foundrymen out where other remedies fail. Silicon copper is quite brittle and can readily be broken up in small pieces. When broken up this way it should be added to the metal after the other ingredients of the mixture are in the crucible. When it is to be used in the production of pure copper castings it should be placed in the crucible just before the latter is taken from the furnace. The mixture should, of course, be well stirred and skimmed before the metal is poured.

Nickel and cobalt rarely occur in market lead. It is stated that from one to two per cent. of antimony favors the entrance of nickel and cobalt into the lead.

A NEW BRASS SOLUTION.

By H. J. Hawkins.

There are many methods of making a brass solution, all being practically the same in the essential elements, while they vary in the non-essentials. In other words, all brass solutions are composed principally of carbonate of copper, carbonate of zinc and cyanide of potassium, in varying proportions, according to the nature of the work to be plated and the color desired. A very good brass solution may be made by using the above three ingredients with sufficient water to make the desired quantity, without the aid of any of the non-essentials, such as arsenic, ammonia or any form of soda. There is no doubt but that any of these ingredients will have the effect of brightening the deposit and removing the scum that some times forms upon work being brass plated, especially that work which is heavily plated to stand the buff.

It is a recognized fact by experienced brass platers that the simplest solution which will give the desired result is the best to use and will give the least annoyance. It is an undisputable fact that small quantities of arsenic judiciously added from time to time will produce a fine yellow and bright deposit, if the solution is otherwise well balanced. The difficulties lie in knowing how to properly prepare the arsenic for the solution, how much to add and when to add it. It is the usual method with many platers to add to the solution a small quantity of arsenious acid in the powdered form and then stir up the solution. This is wrong, as it is quite a difficult matter to take up arsenic with cyanide, and to do it properly requires much stirring, using a concentrated solution of C. P. cyanide of potassium.

When a brass solution becomes accustomed to or saturated with arsenic, it must have it whenever the arsenic becomes worked out or neutralized, which condition is readily shown by the uncontrollable freaks of the solution. The deposit will be grey, muddy or spotted, being copper in one spot and brass in another, the deposit usually being lifeless. When all other remedies fail to bring this solution back to a normal condition, a few grains of arsenic will give immediate results. Arsenic should be prepared in the following manner for addition to brass solution:

Arsenicious acid	4 ounces
Cyanide	2 pounds
Liquid ammonia	1 pint
Water	1 gallon

Dissolve the cyanide in the water, add enough of this to the arsenic to make a thin paste. Then add it to the cyanide until all is dissolved; then add the ammonia, allow to settle, so that if there is any undissolved arsenic it will settle at the bottom. Keep tightly covered.

This solution should contain fifteen grains of arsenic to the ounce, and should be used sparingly, as too much arsenic in a solution is worse than not enough. Liquid ammonia will usually give just as desirable results without the bad features which arsenic sometimes causes. Liquid ammonia may be added to the brass solution in large quantities without any detrimental effect. In a solution containing one hundred gallons of brass, the addition of a quart of ammonia two or three times a week will usually keep the solution in good condition and give a bright and uniform deposit. Bisulphite of soda added from time to time in small quantities will give beneficial results and cause the solution to yield a bright deposit.

These methods are all old and tried and are familiar to all platers who have to do with brass plating. I wish now to describe a simplified form of brass solution that so far as I am aware is new to the trade in general. It is not only simple and easy of construction but, so far as my experience goes, will not get out of order as easily as the ordinary solution. Work may also be run a great length of time without any detrimental results, such as a scum forming on the work or blistering. It matters not how long the work is run, the deposit does not seem to be subject to blistering and failing, as is often the case with the ordinary solution. It will stand the acid dip, "Bright dip" perfectly, when run from one and a half to two hours. Another remarkable feature is that it will hold the same uniform color with a full load or with only two or three pieces in the bath, regardless of the amount of current used. If, however, a full load is put in the solution and the voltage reduced to a low point, the deposit is apt to run somewhat red. I have run a solution such as I am about to describe, containing five hundred gallons, for several months with the most pleasing results, the deposit from day to day being uniform and satisfactory.

The solution is made as follows: Make up an ordinary copper solution using

Cyanide of potassium	1 pound
Carbonate of copper	12 ounces
Ammonia	4 ounces
Water	1 gallon

Enough cyanide should be added to the copper to make a clear solution, taking up all the carbonate of copper and leaving a little free cyanide in excess. The success of this solution depends largely upon the anodes, which must be of yellow sheet brass and cut in thin strips about one to two inches wide, and hung with good connecting hooks, close together to form sufficient anode surface. The principle is that electro-corrosion is greatest from exposed edges and high points, so we endeavor to have our anodes practically all edges. The solution is now worked hard continuously for several days and it will be found that it will soon run into a beautiful brass color, almost exactly the shade of the anodes.

Owing to the great number of edges exposed and their rapid corrosion, it is not a difficult matter to run enough metal into the solution from the anodes to get the desired result. This five hundred gallon brass solution I speak of was connected up to run double; that is, two rows of work. I think I had about 120 anodes, 40 on each side and 40 on the center rod. They were hung close together, but did not touch. It was not unusual to run a batch of work with a strong current for two and a half hours, the work coming from the solution almost as bright as it was after being in the solution five minutes. A remarkable feature about this solution was that a piece was seldom ever lost from failing or blistering, no matter how long it was run. The class of work was picture frames made of lead soldered to tin rims, being duplexed first and then bright-dipped, brass-plated, then dipped again preparatory to gilding. If the work was not run more than a half hour it could be gilded directly from the brass bath, without any bright dipping. The only additions made to this solution were carbonate of copper once a week and liquid ammonia about twice a week. This solution has many features superior to the old-style

brass solution, and so far as my experience goes, it has none of the bad habits common to all brass solutions.

Some one may ask, Why use the carbonate of copper to begin with? I will say it has always been my experience with brass solutions that about double the usual amount of copper given in most formula for brass solutions must be used to get the desired results. Then again I have always found that a brass solution which has good yellow brass anodes and plenty of surface, if it is worked continuously, seldom if ever needs the addition of carbonate of zinc. But carbonate of copper may be fed to it in large quantities and often.

Some months ago I was called out of town to fix up a brass solution, which the plater declared was made just according to the formula, he having his scales and weighing the proper quantities of the different chemicals which a brass solution is usualy composed of. I am not a believer in precise amounts in making up ordinary solutions, because the potency or strength of the different chemicals very at times from different causes. The solution, too, especially brass, must be made to suit the work. For example, a solution that works well and gives good results on stampings of sheet steel will not always work well upon cast heavy iron; then again, a brass solution adapted to lead or spelter goods would be very apt to give inferior results upon either steel stampings or cast iron. So, I say, that the experienced plater will make his solution to suit his work. However, the man with a limited experience upon brass work must have something to go by, hence he follows the formula often with unsatisfactory results. This particular brass solution of which I speak contained 150 gallons. I soon discovered by the appearance of the work and other familiar signs that the solution was deficient in copper, while it had a surplus of zinc. The major cause for this condition in this particular case was principally from the fact that dry carbonate of zinc was used, but wet carbonate of copper, making a very material difference in the amount of each metal supposed to be used. The zinc being dry was full weight, while the copper, being wet, is copper minus the weight of water in the precipitate.

Some platers weigh up the sulphate to the amount required in carbonate, then proceed to make it into carbonate with the idea that a given quantity of sulphate of copper will produce an equal amount of carbonate of copper. This is an erroneous idea and causes lots of trouble among platers. The first thing to be done with this particular solution was the adddition gradually of about forty pounds of wet carbonate copper, which contained perhaps not much more than twenty pounds of metal, as it was freshly made and naturally contained much water. After this addition of copper the solution plated nicely, the deposit and color being all that could be desired. As the solution was supplied with first class "yellow brass" cast anodes, I advised the plater not to add any more zinc, but to add copper carbonate from time to time. Good brass anodes supply zinc to a brass solution much faster than is generally supposed, as is shown in this particular instance. I returned to this shop in about six weeks and found he had not added a particle of carbonate of zinc, but had added forty pounds of wet carbonate of copper and used four or five gallons of liquid ammonia. He probably used more of the latter than was necessary, but he was getting beautiful results, which is the principal object in view.

All my experience with brass solutions goes to prove that the form of brass solution above described should be of great value and simplify the brass plating process on all kinds of work. Of course the conditions should be as nearly perfect as possible in regard to anode surface. Large cast or sheet anodes will not suffice. The anodes should be many, narrow, and hung closely together, and the solution should be run continuously with frequent additions of liquid ammonia, until enough metal has been drawn from the anodes to produce the desired color.

Before adopting this method of making a brass solution, it will be wise to make up thirty to forty gallons first and see if it can be successfully adapted to the work in hand. It is my opinion from my limited experience with this solution that it will be found of universal value upon all classes of work and give little, if any more, trouble than a nickel solution. I will say in conclusion, for the benefit of those desirous of trying this solution, that I have been unable to get good results from small solutions. It is not desirable to try the experiment with less than twenty gallons of solution.

THE PLATING OF ALUMINUM.

By A. Giroux.

Aluminum is a very difficult metal to plate, and for a long time has baffled the endeavors of platers to plate it successfully. It is well known that a great many efforts have been made and many were the suggestions for solutions applied and not applied for patent, but practical successes have been few and far between. The process used by the writer, however, has given him satisfactory results, and it depends for its success to the greatest extent on the preparation of the articles. The procedure to be adopted is as follows:

The articles are first cleaned in cyanide of potassium for a while, until the greasy spots are loosened. They are then cleaned thoroughly with a pumice brush until the operator is certain that a clean surface has been obtained. They are then well washed and dipped into potash until gas bubbles are evolved, and are then immersed into cold water. They are then dipped in a solution containing one-half ounce of corrosive sublimate and four ounces potassium cyanide in three gallons of water. From this dip they go again for the second time into caustic potash just for a dip, and they then go into the plating bath. Now, no matter what solution is used, the article must take equally divided current, that is, the current must be just enough to plate slowly, and therefore the articles must not go into any striking bath or other bath which evolves gas. It appears that adherent plating can only be successfully obtained if the current is very slow and proportionate to the surface of the plate, and if any possible evolution of gas is avoided. The writer by using this process has plated aluminum with success and can recommend it.

NEW BOBBINS FOR SPINNING LOOMS.

In order to make the paper bobbins, which are quite extensively used in textile works, more durable, R. Nasler, of Augsburg, Germany, has invented a method of plating them. According to Mr. W. P. Atwell, United States Consul at Roubixa, France, in U. S. Consular Reports, the process consists in the first place in giving the paper bobbins a rubber or other coating, so as to make them impervious to the action of the solutions. The process of rubber coating may be repeated until the coating acquires the desired thickness. The bobbins are then rubbed with spirits of turpentine, so as to prepare them for a coating of metal dust or fine graphite, in order to make them conductive. They are once more polished so as to render them as smooth as possible, and are then introduced into the electroplating bath, the solution varying according to the nature of the metallic coating desired.

THE SILVER REVOLUTION; CHEAP SILVER AND ITS CONSEQUENCES.

By Our British Correspondent.

During the past few years a remarkable change has taken place in connection with the Birmingham jewelry trade in consequence of the cheapness of silver. Certain branches of the industry have, in fact, passed through a complete revolution. The movement is still in progress, and is quite likely to yield still more important consequences.

Birmingham is the home of the electro-plating industry. Many years ago the clever metal workers of the city discovered the vast variety of uses to which electro-plate in various artistic forms could be put, and owing to its comparative cheapness, as well as to the appeal of such articles made to the popular taste, electro-plated goods found their way to all parts of the world. The popularity of these goods facilitated the building up of hundreds of establishments large and small, practically all of which have enjoyed a remarkable run of prosperity. Now, however, owing to the cheapness of silver, electro-plate is being largely superseded as far as the old uses are concerned, and if the manufacturers had not been resourceful enough to adapt their plant to the more valuable metal and to devise new uses to which the cheaper ware could be put, they would have had to shut up their establishments.

The latest returns of the Birmingham Assay Office are very significant of the change that has taken place. Last year the silver goods hall-marked totalled 3,682,000 ounces. Ten years ago the amount was 1,796,000 ounces, while twenty years ago the total was under a million. It must be remembered that last year was a bad year for jewelry and plate generally. Any revival of trade in the coming year will drive the trade forward by leaps and bounds. It is material to notice that it is substantially pure silver, and not alloys that are being sold. The Birmingham standard requires that the silver to qualify for the hall-mark must contain 925 parts of pure metal out of 1,000. Anything below this standard is destroyed without compensation to the owners, by the Assay Master. The German standard, it may be noted in passing, requires only 800 parts of pure silver per 1,000, and a curious circumstance is that foreign goods sent to the Assay Office and coming below the standard are scrupulously returned to the owner. These details of Assay Office procedure go to emphasise the significance of the great growth of the returns. Hundreds of articles of pure silver ane now submitted for the hall-mark which were formerly unknown at the Assay Office.

The following is a list of silver articles, taken at random, now popularly sold, which a few years ago were unknown except in a very few instances as silverware: Ring stands, bon bon-, pomade-, hair pin-, toilet- and puff-boxes, hat-pin stands, prayer-book cases, spectacle cases, clothes brushes, sweet-trays, bon bon dishes, chain-purses, card cases, silver belts and watch stands. It will be seen that the demands of the luxurious lady's toilet table are mainly responsible for the above demand. To this list must be added miniature five o'clock tea-sets. Silver napkin rings which are very light and can be had at about 1s. 9d. each are also very popular with the ladies.

Probably no article has seized the feminine fancy like the silver-backed hair-brush. As the silver can be made as thin as tissue paper, no thicker than two or three thousandths parts of an inch it can be produced very cheaply, and consequently has a great sale. It will not stand much rough usage, but while it lasts it may be depended upon to keep its color. Other nick-nacks extremely popular are cigar ash trays, cigarette and cigar cases, and tiny stamp boxes, with trinket receptacles of every imaginable description. Local show-rooms simply glitter with the display of silver of innumerable descriptions, from manicure sets and button-hooks to tobacco bowls, pipe-stands, rose-bowls, shaving sets, and epergnes. Probably the highest demand has been in what is known as photographers', hair-dressers and druggist's branches, comprising photographic frames, purses, brushes, combs, button hooks and toilet-room nick-knacks which are cheap mainly because of their shadowy thinness.

To a more limited extent the change has affected articles of general domestic use such as ordinary tea-

SILVER TEA AND COFFEE SERVICE.

sets, coffee-sets and spoons and forks. Practically the only branch of the electro-plating trade which has remained unscathed through the trial is the trade in heavy goods. It is still necessary, for instance, to make dish covers and large trays weighing from three to four pounds from electro plate. Such goods in solid silver would be so expensive as to be out of the reach of the ordinary purchaser, $75 being a common price for a solid silver tray of small dimensions. All hotel ware also is made out of the cheaper metal. This is partly due to considerations of price, but another very important element entering into the consideration of the hotel proprietor is that of risk. Silverware offers much greater temptation to thieves and burglars than electro plate, while adding enormously to the responsibility of those charged with the safe keeping of the goods. In this connection it is clear that the present epidemic of burglaries in the jewelery quarter has a direct relation to the silver revolution. The question of wear and tear also is one that can hardly be ignored. Electro plated ware is more durable than silver for the rough and tumble usage of the kitchen and the dining table of the boarding house and hotel, or even of the large family.

The electro plate manufacturer has also found means of recouping himself by turning his hand to other goods formerly for the most part made of different material, such as bread boards and knives, cheese scoops, cruets, butter dishes and flower stands. The result is that taking the trade as a whole it is doubtful whether in bulk the electro plate output has really diminished, and every credit is due to the local manufacturer for his enterprise in rising to the occasion, and turning apparent misfortunes into sources of profit and income. For such substantial family articles as tea pots the difference between 7 shillings for electro plate and 30 shillings for silver will still give the commoner metal a good lead over its richer competitor. But, on the other hand, buyers are fully alive to the superior advantages of silver when the necessity arises for rejuvenating an old tea pot by repairs.

The question whether the trade has benefited by the change is one not altogether easy to answer. The goods sold are nearly twice the value, and as this increases the amount of income in relation to the dead charges, this is so far an advantage; but on the other hand, the manufacturer turning out electro plate and having no severe Assay Office test to face, has much greater freedom in regard to quality, and could leave himself a greater margin of profit. The rigid necessity to give to his customer a high intrinsic value leaves the margin of profit narrower, while on the other hand, the customer, having to pay prices relatively so much higher, demands that the rate shall be cut down to the lowest possible figure. In one direction, the manufacturer has benefited, as he has found it possible to employ machinery to a much larger extent. Silver is a much softer, and generally much more manageable metal than electro plate, having nothing like the same liability to crack under various forms of pressure. Consequently, stamping machines can be used, employing a lower and cheaper grade of labor, and in this direction some little saving has been effected. It would seem that on the whole the manufacturer and the Birmingham trade generally have benefited. It semes inevitable that prices will still further cheapen, thus increasing the bulk of trade. In the largest houses, the system of producing single articles is dying out, and goods are now commonly turned out and sold by the gross. On the other hand, heads of households are taking more kindly than ever to silver. In this line, it would seem that price is very far from being a prime consideration, and purchasers, who on various sentimental grounds would do without an article rather than buy electro plate, find genuine silverware an irresistible attraction. At present, the selling price is from one-third to one-half more than electro plate, but the margin of difference is certain to be reduced at no distant date, and there seems no reason to doubt, that in the future an industry will be built up on a more extensive scale, than was ever known in the palmiest days of the Birmingham trade.

The change has worked rather hardly in certain directions, particularly in regard to those, who, when it commenced, had on hand stocks of old silver. Formerly this would very easily fetch 10 shillings an ounce; now the outside figure is 5 shillings. This about represents the relation between the old and new prices. Raw silver, formerly selling from 5s. 6d. to 5s. 9d. per ounce is now about 2s. 9d., and the tendency seems to be downward. The development of the silver industry has figured somewhat in the widespread fiscal controversy, owing to the coincidence, that the greater cheapness of silver, with its far-reaching consequences, commenced with the abolition of the duty of 1-6d. per ounce. It is recognized that, owing to other causes, a vast amount of stored silver came on to the market about that time, but the influence of the removal of fiscal restrictions is generally recognized. There is no doubt that while a proportion of the jewelers are disposed to support Mr. Chamberlain's fiscal reform proposals, any experimental duties on silver will meet with strong opposition.

While Birmingham jewelery houses have been rather severely hit by heavy importations of cheap artificial jewelery, it is generally agreed, that in regard to genuine silver goods, the home makers are practically in possession of the field. A certain proportion of American goods pass through the Assay Office, and receive the local certificate of merit, but the proportion is relatively small, and local manufacturers profess to regard any such importations with equanimity. On all hands, it is agreed that the silver revolution, wide as are its ramifications, is only in its infancy. With unlimited cheap labor available, and the possibility of large extensions of machinery, no doubt is entertained that in the future cheap silver goods will be used for a great variety of purposes now served by commoner, less ductile and less showy metals.

CLEANING OFF-COLOR CASTINGS.

By Charles H. Proctor.

One of the greatest difficulties connected with the subject of alloys is their tendency to separate somewhat on cooling according to the specific gravity. It is not surprising, therefore, that occasionally the patterns should be off-color. Sometimes they show a white surface, owing to a number of probable causes. This is one of the things in foundry practice that have to be endured and which means a resort to chemical means to bring the metal back to the natural color.

The writer uses a 15 per cent. solution of hydrofloric acid, made up with water and used warm. The castings are immersed for fifteen minutes to half an hour and then removed and washed. A second solution is made up of a 15 per cent. solution of caustic potash and is used at a boiling point. The usual dipping acids are then employed to bring the metal back to its natural color. It is well after acid dipping and washing to immerse the articles momentarily in the potash solution and wash them afterwards. This oxidizes the surfaces of the castings and makes the red or yellow color deeper in tone. It is also well to pass them through a soap solution, as mentioned at various places by the writer in preceding issues of The Metal Industry.

Zinc is electropositive to all other common metals, except magnesium, and precipitates all the ductile metals except magnesium, iron and nickel from their solutions. Impure zinc is readily dissolved by nitric, hydrocloric, sulphuric and sulphurous acids, and also by the caustic alkalies. Pure zinc is almost unaffected by acids, except nitric.

The melting point of zinc is given as about 415 degrees Centigrade, and its boiling point at about 920 degrees Centigrade. In melting zinc, the increase in volume from the cold, solid state to the liquid is 11.10 per cent. Metallic zinc burns in the air at a temperature as low as 500 degrees Centigrade.

THE MAKING OF AN ODD SIDE FOR A MOLDING MACHINE.

By J. W. Scully.

The making of an odd side is not a new matter to the every day hand molder in brass foundry practice, and every practical molder is well aware that to accomplish a good day's work from a number of loose patterns, the only way for him to do is to make up a sand odd side and, with interchangeable flasks at hand, start in to do a good day's work. The molding machine, which is fast taking the place of the hand molder, is condemned in a good many cases by the molder as well as the foundry foreman, but this is owing in a great measure to the fact, that it is not fully understood by them and their good working qualities are not appreciated. To install molding machines in a foundry together with the required attachments such as the air compressor, piping, patterns, etc., means no small expense to the manufacturer, but nevertheless the molding machine is indispensible in any foundry doing a regular routine of work. If the men opposed to them would only give them more study and consideration, they would find their efforts amply rewarded.

It is fully appreciated by the writer, that all patterns cannot be worked to advantage on the molding machine. As is well known to any practical foundryman, it is an expensive matter to get up a set of patterns for hand molding, but it is still a greater expense to get up a set of working patterns for the molding machine, and it does not warrant the manufacturer in all cases to go to the expense of making split patterns or plating up patterns on match plates. It is, however, possible to work a great number of patterns on a molding machine by making an odd side or match. In some cases the common sand odd side can be used with good results, but for durability and where a large number of castings are required, the writer recommends the plaster of paris or linseed oil odd side. The plaster, however, is to be preferred.

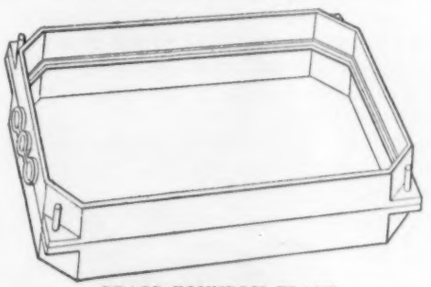
In order to operate an odd side, the loose patterns are first gated up on a common gate and the gate is attached to a metal frame of the size of the flask used on the machine. The frame should be at least one-half inch thick and one inch wide, with handles at each end to enable the operator to draw the pattern from the sand. On each end of the gate, close to the frame, there should be a small core print known as a stop-off core, which is to prevent the metal from running out while the mold is poured. The frame should be drilled to match the flasks used. After mounting the patterns on the frame, the latter is set on the flask in the same manner as a match plate of patterns. An odd side is rammed up and the parting is made at the required points on the pattern and a wooden frame is then procured, made of the size of the flask used. This should be two inches deep or deeper as required, with a bottom made to be held with screws.

A quantity of plaster should then be mixed up, enough to fill the frame well. The pattern should be coated with any common oil and the mixed plaster is poured on the odd side, the frame being filled up flush to the top. It is well to have a one-inch hole bored in the bottom board, so as to let the overflow of plaster escape, when the screws are put down tight. The plaster is then allowed to set good and hard before removing it from the sand odd side. The mold is shaken out, the sand is cleaned from the plaster match and two or three coats of shellac dissolved in wood alcohol are given. After the shellac is dried the plaster odd side is ready for use. The vibrator of the machine is then attached to the metal frame, so as to enable the operator to vibrate the patterns while drawing them from the sand.

This metal frame may be used for an unlimited number of gates of patterns by removing the screws and changing the gates of the patterns. The foundryman will find the method described very simple and inexpensive, when he becomes familiar with it. It is customary for the writer to gate up a variety of patterns on the same gate and make a match for them and produce good results.

PRACTICAL BRASS FOUNDING FLASKS.

Mr. C. Vickers in a paper under the above title before the recent convention of the American Foundrymen's Association, held in New York City on June the 6th to the 8th, briefly described a flask for brass founders use. It is illustrated in the accompanying figure. The pins are placed on the corners, thus making the flask really octagonal in shape. The author states that the arrangement makes a very neat flask and one that occupies a minimum of floor space. It is also very light and the position of the pins greatly facilitates the clean lifting of the cope, which is so desirable in brass molding. The sides of the flask are straight and the sand is retained by a narrow ledge on the inside of the flask at the joint. The author states that his experience has been, that a straight side flask with this ledge inside will hold the sand much better than a flask, the sides of which are beveled, as the cope of this latter flask has a tendency to sag and cannot be rammed as soft as the straight side flask.



BRASS FOUNDRY FLASK.

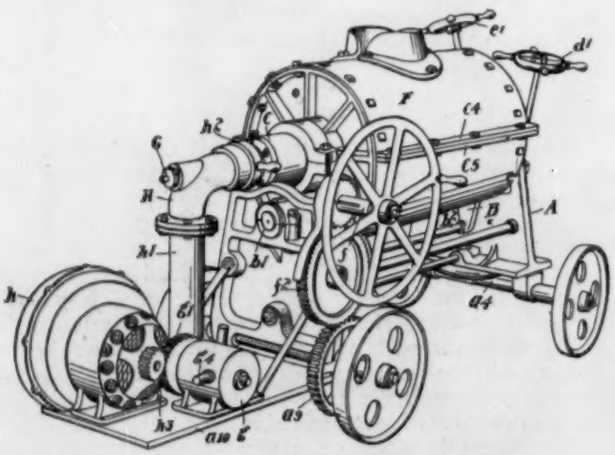
The object in placing the pins on the corners is to abolish the protecting lugs, as projecting lugs are a bad feature on any brass molder's flask because they bind very easily. In lifting off the cope the molder must balance it, and this is made more difficult the farther the pins are extended out from the sides of the flask. The author states that the handiest sizes for brass molders flasks are 18 x 12 x 6 inches, and 11 x 16 x 5½ inches inside measurement, that is, 18 inches long, 12 inches wide and a 3-inch cope and drag. The 11 x 16 x 5½ size is, in the opinion of the author, to be preferred for general use. Larger flasks than this are heavy and awkward to handle, and unless they are barred are liable to drop out frequently, so that it is more economical to have a smaller gate with fewer patterns and a light and easy working flask than a larger gate, a few more patterns and a heavy, clumsy flask.

Flasks for brass work are said by the author to be much better with four pins than with three, the old-fashioned projecting lugged three-pinned flask being undesirable for any kind of brass work, not only on account of their liability to shift, but because they do not lift with the steadiness of four-pinned flasks. A two-pinned flask is to be preferred to a three-pinned one, provided the pins are carried by the handles of the flask as in the snap. He also calls attention to the desirability of making pins with a slight taper in order to cause them to give no trouble in securing clean lifts and to get over the difficulty of sticking, as is the case when the straight pin becomes rusted.

PORTABLE METAL MELTING FURNACE.

An improved type of metal melting furnace has recently been patented by Mr. J. Porteous. The readers of THE METAL INDUSTRY are familiar with the earlier construction of this furnace. The operation on the present type, which is described in United States patent 790,311, May 23, 1905, and illustrated in perspective view in the accompanying cut, is as follows: After the metal to be melted is placed into the furnace the pipe g^4 is coupled by means of a hose or pipe to the supply of oil and the electric motor is started into operation. The rotation of the motor actuates the pump g and causes the oil to be carried up into the furnace by means of the pipe g^2. The quantity of the oil is regulated by the globe valve g^3. The air is carried up through the pipe g in order to mix with the oil, so as to produce a high degree of heat in the furnace. After the metal has become molten, the motor is stopped, the pipe g^4 is disconnected from the source of oil and by revolving the hand-wheel F, the furnace is guided to a point over the flask which is to be filled.

By revolving the hand wheel e the furnace C rotates



PORTEOUS PORTABLE MELTING FURNACE.

upon its axle c. If the lips c'' should be brought into such a position, by the turning of the furnace upon its axis, that the molten metal would not strike the gate-hole centrally, as the metal is being discharged, the relative position of the lip to the gate-hole may be regulated by revolving the hand wheel d. This will revolve the yokes B and B' about their shafts b b' and move the furnace bodily transversely to the frame. By means of the hand wheels $d'e'$, the position of the discharge of the furnace relative to the point at which it is desired to discharge the metal may thus be regulated readily. After one flask has been filled the furnace may be conveyed to another flask by turning the hand wheel F, and that procedure may be continued until the metal in the furnace has been all poured into the flasks. When it is desired to reheat the furnace, all that is necessary is to couple up the hose for the oil to the pipe g^4 again and to start the motor h.

A recent apparatus, patented May 13, 1905, by L. T. Weiss, of New York, provides for the separation of gold from other materials by introducing the gold bearing material into an electro-plating tank, which is provided with iron anodes and a solution of sal-ammoniac. The iron anodes are attacked and the gold receives a coating of metallic iron. It is afterwards separated by pouring it in a thin stream over electro-magnets.

GRINDING OR POLISHING APPARATUS.

The apparatus shown in the accompanying cut, which was recently patented by H. A. Weber, of New York, with United States patent 790,943, of May 30th, 1905, has for its object to receive and draw off the flying particles which are liberated during grinding and polishing. The means by which this is accomplished consist in the placing of a peculiar-shaped hood 3 over the grinding wheel 1. The grinding wheel moves downward in the direction of the arrow. The hood is provided with a number of curved vanes 5 which are so arranged that the particles and the air currents which are generated by the rapid rota-

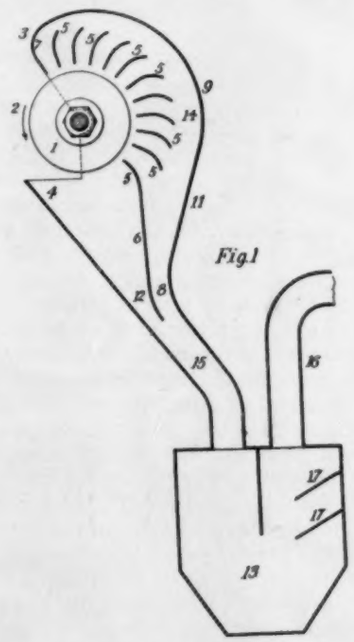


Fig.1

GRINDING APPARATUS.

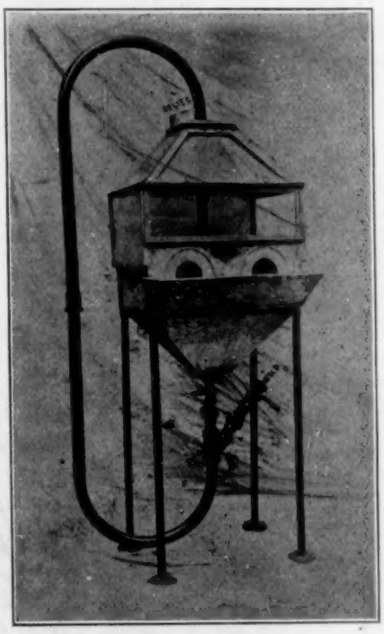
tion of the wheel impinge upon them and will be deflected outward and backward toward the outer peripherial wall 9 of the hood. They are then directed into the conductive channel 14, from which they pass into the outlet 8 and down the channel 15 into a receptacle 13. The particles settle in this latter receptacle and the air passes out at the outlet 16 after passing over downwardly inclined partitions 17. It is stated that the exhausting device acts automatically by reason of the peculiar shape of the arrangement, no other drawing-off machinery being required.

SAND BLAST APPARATUS.

A recent construction of a sand blast apparatus shows an air tight reservoir in which the sand is stored preparatory to use and which is provided with an air tight head, in the center of which an inwardly opening valve is fixed. There is another inwardly opening valve fixed at the bottom of the apparatus, which communicates with the sand outlet pipe into which the air is introduced from the other side. The principal point of the apparatus is the fact that both of the sand controlling valves are located within the reservoir and close with the pressure from within, while the crank shafts through which they are actuated are both located upon the exterior of the reservoir. Both valves are therefore forced towards their seats by the internal pressure. The apparatus is patented by F. W. Breidster, of Milwaukee, Wis., May 30, 1905.

A SAND BLAST FOR METAL WORKERS.

Since the publication in the May issue of THE METAL INDUSTRY of the article on "The Use of the Sand Blast in the Plating Room," we have received a number of inquiries for a sand blast suitable for brass workers, nickel platers, silversmiths and manufacturing jewelers. The accompanying cut shows such a blast which is patented and manufactured by Theodore A. Sippel, 205 McWhorter street, Newark, N. J. The machine is constructed of galvanized iron and occupies but little space. The sand is put in at the base of the machine occupying about one-third of the space of the air chamber, the air blast is then



SIPPEL SAND BLAST.

turned on from the outside pipe which draws the sand down and up through pipe which leads into the top then down to the inside. After the sand has blasted the work the sand falls into the base and is used over again. The side of the machine is provided with a door for the admittance of articles which are to be blasted and the front of the machine has a glass window in order that the progress of the work may be inspected without shutting off the blast. Besides being particularly suitable for metal workers and platers, the machine can be used for decorating glass.

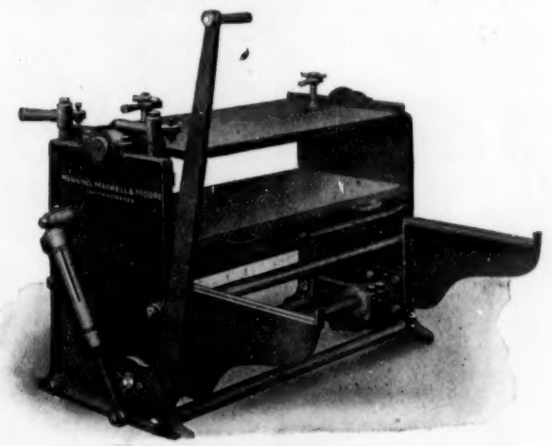
THE COMPOSITE GRAPHOPHONE.

In the February issue of THE METAL INDUSTRY, 1905, we mentioned the various metals which enter into the construction of the automobile and explained the great variety of metals which made up this composite machine. It is interesting to note the number of metals which may be seen on even smaller pieces of apparatus, for instance the graphophone made by the American Graphophone Company, of Bridgeport, Conn. The metallic parts of one of their machines will consist of their ZA alloy which is 90 parts zinc and 10 parts aluminum; also their AZ alloy which is 75 aluminum and 25 zinc. There will be several grades of brass and all of the parts may be copper or nickel plated, for the company is plating aluminum very successfully. There will also be brass and aluminum horns for transmitting the sound and in order to get horns of particular shape the company have recently imported some aluminum ones from France. The construction of the machine shows that even in an instrument as small as the graphophone what a variety of the non-ferrous metals and alloys are necessary to make a complete machine.

A NEW ROLL OVER MOLDING MACHINE.

In the June issue of THE METAL INDUSTRY there was published cuts and descriptions of the various types of molding machines suitable for the brass foundry and the advantages to be gained by the use of molding machines was described in detail. A new style of machine not mentioned in our June issue is the molding machine shown in cut which is of the roll-over type and which is giving very efficient service in some of the largest brass foundries.

As will be seen the machine is all above the floor and can be located in any convenient place or can be moved about the foundry. The counterbalancing is done by springs incased in a box at either end of machine. These can be adjusted very quickly for the varying weights of flasks and molds used, the cranks and arms being so arranged that the counterbalancing is perfect at the point where the mold is being drawn from the pattern.



A ROLL OVER MACHINE.

The plate to which the pattern is attached is secured to the top of table, the flask secured with clamps and it is then rammed up and the bottom board rubbed on and placed on the elevating table. The flask is revolved, the bottom board brought up in contact with the flask by means of a lever. The clamps are then loosened, the top of the table rapped sufficiently and then the mold is lowered by means of the lever. The movable platform is drawn out onto brackets and the mold is ready to be removed. This movable platform is fitted with rolls running on guides, which gives it an easy movement.

When in working condition the movable parts are boxed in to protect them from the sand. This machine will take flasks up to 28 inches x 18 inches and is specially useful where accurate and uniform size of castings are required. The total weight is 1,200 pounds. The roll-over machine is manufactured and sold by Manning, Maxwell & Moore, Inc., No. 85-87-89 Liberty St., New York.

Impurities common in commercial zinc are lead, iron and cadmium while small amounts of arsenic, antimony and sulphur occur also. Some spelters have been found to contain small proportions of copper, silver and tin, while minute quantities of thallium, indium, gallium, magnesium and aluminum have also been observed in rare instances.

CORRESPONDENCE DEPARTMENT

In this Department we will answer any question relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York.

Q. A subscriber would like to have some information about the process used for etching silver-plated hardware.

A. For etching silver-plated hardware, paint the surface to be etched with asphalt varnish or air-drying japan and expose the parts to be etched. Place a border around the outside made of soft beeswax or asphalt or putty. Nitric acid should be used, diluted with five times the quantity of water, and the surface should be covered about ¼ inch deep. After the desired depth is reached the acid is removed and the plate well washed. The etching ground may be removed with turpentine or benzine.

Q. A plating firm sends a sample finished with a bronze finish and asks for a formula for producing it.

A. Referring to the sample of bronze finish, the sample is evidently made from copper. If made from brass it would have to be copper-plated and a dead effect produced with a fine brass wire scratch brush and pumice-stone with water. This procedure gives a dull effect similar to brush brass. The articles might also be sand blasted. A solution made of ¼ to ½ oz. of barium sulphide to the gallon of water, used very slightly warm, will produce a chocolate brown color. The articles are washed, dried and lacquered in a matt lacquer, which may be produced as follows: Dissolve 30 parts of gum sandarac and 7 parts gum mastic in 320 parts amyl acetate and add 100 to 200 parts benzine. A lacquer called mattoleine for this purpose is also in the market.

Q. A plating firm asks for a bright acid dip and method for cleaning brass plated goods.

A. A bright acid dipping bath is made up from 1½ parts of sulphuric acid, 1 part yellow aqua fortis and 1 ounce of muriatic acid for each gallon of mixed acids used. This solution should be made up at least 24 to 48 hours before using it, adding any old scraps of brass or copper to bring it to its proper action or until a piece of brass work is properly dipped. The only method of cleaning brass plated goods is to take off the lacquer in a potash bath. After that the articles are washed and passed through a cyanide solution, which is made up of eight ounces of this salt to the gallon of water. The articles are then washed again, dried out, repolished on a soft buff and lacquered. If the articles have a sufficient thickness of plating, and if they are free from unplated bare spots, a very rapid dip can be given them in the bright acid dip. If the plated deposit is not worn through, this method of procedure will make the deposit look new. The articles are then slightly buffed and lacquered. Otherwise the only remedy is to replate the articles.

Q. A subscriber desires information relative to a formula for a bronze solution for plating steel.

A. A bronze bath, to be used hot or cold, may be made up as follows: Take 2¾ ounces of acetate of copper, ¾ ounce carbonate of zinc, 3½ ounces carbonate of soda, 3 ounces bisulphite of soda and 7½ ounces of pure cyanide of potassium to one gallon of water. The bath is prepared by dissolving the two sodium salts separately in two-thirds of a gallon of water, and adding the copper and zinc salt. The cyanide is dissolved in the remaining one-third of a gallon, and both solutions are then mixed together. Anodes of low brass are used. To regulate the color a solution of ammonia water, which has been saturated with carbonate of zinc, is used. If the color is too copperish, small quantities of this solution are added, and the bath is well stirred. This addition is continued until the desired color is obtained.

Q. A manufacturer sends a sample of red metal casting made from No. 1 hand-picked scrap. The castings run from one to two pounds each. Fine cracks show up in the metal. He asks what is the matter with the sample.

A. An analysis of the sample of red metal casting is necessary to eliminate or show the following causes of defect, such as too much sulphur, too much iron, oxidation as shown by the condition of the tin present, or whether the mixture is one unsuited for such castings. Without an analysis it can only be said that the cracks may be due to a combination of the above causes, or, if the metal is all right in every respect, they may be due to the result of segregation and crystallization after pouring at too high a temperature, with a resulting internal strain. This last is more likely to happen with some mixtures than with others.

Q. A subscriber says that his 8-carat gold is made of fine gold, silver and copper. His 10, 12 and 14-carat are made of fine gold, silver and Wessell's alloy. He has trouble with blistering and gray spots on the metal, which has also a bad appearance. He asks for information in regard to this trouble. He also asks for a 8-10-12-14 carat gold alloy to resemble yellow 18-carat gold.

A. The reason for the blistering and the gray spots in the alloy probably arise from the imperfect amalgamation of the materials used, and perhaps from the fact that the copper used is not chemically pure, but contains iron. If nothing but chemically pure materials are used and a small addition of leaf brass is made, the trouble is likely to disappear. The formulas for the desired alloy are as follows:

	Gold.	Copper.	Silver.	
8 kt.....	333.333	425.000	241.667	
10 kt.....	416.667	487.300	96.033	This alloy is red gold.
12 kt.....	500.000	279.000	221.000	
14 kt.....	583.000	170.000	247.000	

The latter gives a yellow color. Should the color be desired to be more red, the composition must be 583.000 gold, 290 copper, 125 silver and .002 brass in the shape of the thinnest and purest leaf procurable.

Q. A subscriber inquires about the preparation of oxide of gold.

A. Oxide of gold is prepared by dissolving pure gold in aqua regia, which latter consists of 2 parts muriatic acid and 1 part nitric acid. About 7 parts of acid are used for 1 part of gold. The mixture is heated gently until the gold is dissolved and the solution is then evaporated until it becomes thick. The chloride of gold thus formed is dissolved in 8 parts of water and crecined magnesia until all the gold is precipitated as a brownish powder. The latter is thoroughly washed in order to remove the acid. Oxide of gold is seldom used in plating baths, chloride, cyanide or fulminate being employed generally. The latter is made in the same manner as the oxide, and instead of using magnesia, ammonia water is employed to precipitate the gold. This process is simple and gives better results.

Q. A subscriber informs us that his work turns dark when plating in a basket nickel solution. Even with a strong current it does not burn, but turns black. The solution stands at 6 degrees, and the anodes are of sufficient number and good quality.

A. If a nickel solution is in a good working condition the black stains produced by plating by the basket method are caused by the solution becoming too alkaline. The latter is due to the strong current used for depositing nickel by the basket method. It would be advisable to add 5 ounces sulphuric acid dissolved in a quart of water to each 100 gallons of solution used. This should be added two or three times a week just before quitting time, and the solution should be thoroughly stirred up at the time of these additions. This procedure will have the tendency of keeping the bath neutral, and will cause it to give a whiter deposit. One ounce of common salt added to each gallon of solution also makes the bath plate better on account of the increased conductivity which is thereby obtained. Dark stains are also caused by using the wire baskets for too long a time without removing the deposit formed on them. This deposit is of a spongy, porous nature, and with a strong current passing through the bath free ammonia is found there, which causes stains. The deposit, when it becomes too thick, should be removed by hammering, not by dipping in acids, as some platers do, as the latter procedure only makes matters worse. You might try to make up a basket from rattan, that is, of the same material as is used in caning chairs. The bottom of the basket might be made of brass wire mesh. This will give better results, producing better work and saving nickel. Of course it must be used only in the plating solution, other baskets being used for cleaning the work.

Q. A brass founder asks for information as to the melting of emery grindings. He has a large amount of this material, and has been in the habit of selling it to the different refiners at a considerably less price than it might be worth to him if he remelted it and made use of it in cheap castings.

A. Emery grindings are of a very refractory nature, and are not easy smelted except when mixed in small quantities when other materials are smelted in large quantities. It would be better to dispose of the material to the firms who make a business of smelting.

TEST OF MANGANESE BRONZE.

The Bridgeport Deoxidized Bronze and Metal Company, of Bridgeport, Conn., furnish us the following test of their magazine bronze:

Tensile strength, 82,880 lbs.
Elastic limit, 45,600 lbs.
Elongation, 20 per cent.
Reduction of area, 20 per cent.

The metal cadmium alloys with many of the heavy metals and amalgamates with mercury. The alloys with gold, platinum and copper are brittle, while those with tin and lead are malleable and ductile. With silver, cadmium forms a series of alloys, and the metal also alloys with aluminum. When alloyed with lead and bismuth, cadmium still further lowers the melting point of the mixture, and thus its addition is taken advantage of in the preparation of fusible metals, such as Rose's metal.

Agitation is being caried on for the purpose of securing a reduction in the tax on alcohol to be used for industrial purposes.

READERS' OPINIONS.

Correspondence is solicited from all of our readers on subjects relating to the founding, finishing, rolling and plating of the non-ferrous metals and alloys. Name and address must be given, though not necessarily for publication. Address THE METAL INDUSTRY, 61 Beekman street, New York.

CASTING AN ALUMINUM PATTERN.

To the Editor of THE METAL INDUSTRY:

The writer had some experience with a pattern some time since, which was quite interesting. The pattern was about 36 in. long, 10 in. wide, and 6 in. deep, to be cast in aluminum and was as thin as would be practical to make. The sides were perfectly square, not a particle of draft allowed on the pattern, inside or out. The writer did not examine the pattern as closely as he might, and supposed the pattern was like others in the lot with draft allowed, and gave the job out to one of the best moulders in the shop, with an order for five castings. The moulder was supplied with four interchangeable flasks, with pins 7 in. long, but found it impossible to take off a cope, without breaking the sand so badly that it was almost impossible to mend it, and it certainly was not practical to mould in the ordinary manner.

We overcame the difficulty in the following manner: We took one of the interchangeable flasks and made a plaster match of one side in the flask, and then another match of the reverse side, in the other half of the flask, thus making a complete mould in plaster. We loosened the pattern in these two matches so it would not stick and rammed a half mould on one side, took off the match and drew the pattern, then placed the pattern in the other half of the match, and did the same. We then had a complete sand mould, without changing coping either side, and had no further trouble making them, the interchangeable flasks acting as a match plate mould.

H. O. WINSLOW.

BRITISH ALUMINUM COMPANY'S EXTENSIONS.

The Loch Lever Water & Electric Power Company, of Scotland, propose to expend $2,500,000 to supplement the extensions of the British Aluminum Company's water power at Foyes and which was completed last December. Plans and specifications of the civil engineering portion of the scheme have been prepared and tenders invited for the carrying out of the project. The work will be carried out under the direction of the British Aluminum Company's engineer, Mr. M. Murray Morrison, M. Inst. C. E., who will also design the power plant and factory. All of the power is to be utilized by the reduction works of the British Aluminum Company, who report that the demand for their product is steadily increasing.

The new zinc plant built by the Kootenay Ore Company, Limited, at Kaslo, B. C., is now being operated with satisfactory results. By the operation of this smelter ores containing zinc occurring in the silver-lead mining district can be utilized.

A recent decision of the U. S. Circuit Court affirms the duty assessed on imported nickel-plated zinc sheets at the rate of 45 per cent. ad valorem. The importers which had appealed for a lower rate of duty were overruled.

PATENTS

A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

787,059, April 11, 1905. DIES FOR DRAWING SHEET METAL VESSELS.—E. R. Stoddard, Detroit. The dies are particularly designed for drawing sheet metal vessels with tapering sides, the object being to avoid the formation of body wrinkles or corrugations by constructing a die in which the walls of the male and female die are maintained in all parts of the operation in such proximity as to permit only the thickness of the metal blank between them. The male die is formed in two sections, which are centrally joined to each other by interlacing fingers, the combination being such that the sections can be separated without disengaging the fingers. In the initial position, when they begin to act on the blank, the two sections of the male die are separated a sufficient distance, so that the inner portion of the die is only so far away from the female die as to permit the thickness of the blank between the dies. As the die is moved upwards into the female die the sections of the male die gradually move towards each other, so that the end walls of the dies are sufficiently far apart to receive the sheet metal, but not to permit any wrinkling. The metal will therefore be formed to exactly the shape of the dies in one operation of the press.

784,536, March 14, 1905. MOLDING MACHINE.—J. N. and H. A. Battenfeld, Cleveland, Ohio. The invention relates to improvements in molding machines of the type wherein a flask is placed upon a bed or pattern plate and is moved under a sand hopper, then under a press, where the sand is compressed around the patterns and is then moved into normal position accessible to the operator. In this construction the pattern plate and the patterns are jarred in order to loosen them from the sand, while provision is also made for the construction of suiable mechanism to raise the flask from the pattern plate and the patterns thereon. The vibrator is set into motion automatically as the traveling bed which carries the pattern plate is leaving the press, and it is also automatically shut off before the plate reaches its rest position. The raising mechanism is so arranged as to secure the straight upward movement of the flask from the pattern plate and the patterns.

No. 790,545. May 23, 1905. CASTING APPARATUS.—W. S. Weston, Chicago, Ill. The apparatus consists of a number of movable molds which are being carried on a chain. Each chain carries one-half of the mold and they are so arranged that they

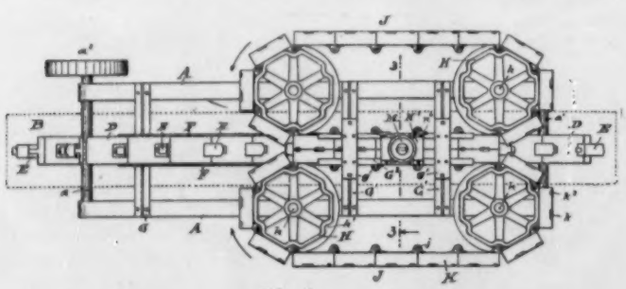
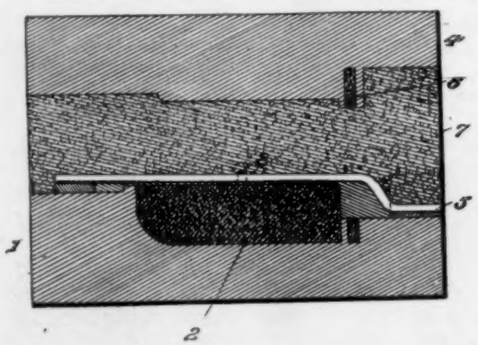


Fig. 1

close together under the hopper which pours the charge of metal into them and separate again at the other end, so as to let the casting drop out. The machinery is described in detail. No. 790,544 of the same inventor describes several modifications of the same idea.

784,617, March 14, 1905. ELECTROPLATING APPARATUS.—H. Fleischer and C. H. Fleischer, New Britain, Conn. The apparatus consists of rectangular tank, suitably supported. The anodes are supported on an endless traveling conveyor, which is formed by link belts arranged one on each longitudinal side of the apparatus, traveling over sprocket wheels at each end of the apparatus. Cross pieces are fastened at intervals between those link belts, thus connecting them and forming the support for the anodes. The latter are immersed successively in the plating liquid and removed at the other end. The chain then travels over a series of sprocket wheels arranged conveniently above the tank, during which passage the anodes may be made to pass cleaning tanks, after which they are again introduced into the plating tank. A similar arrangement is provided for the kathodes, the endless chain for which is located below that for the anodes and the supports for both electrodes are so spaced on their respective chains that a kathode is placed midway between each succesive pair of anodes. The endless chain for the kathodes travels underneath the plating tank in a similar manner to the one provided for the anodes.

788,612. May 2, 1905. CORE FOR MAKING HOLLOW CASTINGS. T. H. Symington, Baltimore, Md. The core is designed for casting journal boxes for railroad cars. 1 is a core box, in which is molded a sand core 2, and when made, a staple 3 is embedded into it. The core 2 when molded is removed from its core box and baked in an oven, in order to give it the desired degree of hardness and strength, so that it may be suspended from rod 5, when placed in the green sand core box and in the mold and may also sustain the weight of the green sand core, which is



built upon it. 4 is the green sand core box, in the lower part of which the dry sand core 2 is suspended from the rod 5. 6 is a dry sand core made in another core box and baked and set up in a suitable groove in the core box, so as to be incorporated into the core. The vacant part of the core box is then packed with green sand occupying the space marked 7, after which the core is complete. The core is then removed from the core box and placed in the mold and a journal box cast within the mold and around the core.

788,601. May 2, 1905. MOLD-COPE FILLING MACHINE. J. Root, Chicago, Ill. The invention relates to an apparatus for filling and packing sand into the cope of an annular mold. The cope of the mold is placed in an inverted position upon a table and centered. A spindle is placed in the center of this table, which spindle carries a sector with scrapers, which can be rotated around the spindle. The molding sand is shoveled upon the cope and the sector rotated by hand. As it rotates, the sand is compressed by a roller and scraped off by the scraper following. The surface of the sand behind this scraper is then smoothed down by a second roller. Small accumulations of sand on the surface of the rollers are prevented by brushes.

789,107. May 2, 1905. MEANS FOR UNITING SHEET-METAL PARTS. B. M. Steele, Peoria, Ill. The device is intended to unite the sheet metal tubes of automatic weighing devices, conveyors, etc., to head or end sections, in a removable manner, so as to be able to dispense with the use of cast metal for the head sections. The overlapping section is provided with a depressed portion, with perforations. The inner section is also perforated. In joining the tubes the perforated parts are placed upon each other so that their perforations register. A bolt is then inserted, which when screwed up, causes the head of the bolt to be drawn up into the depressed part of the outside section, until the head is flush with the inner wall of the inner section.

No. 789,948, May 16, 1905. ARMORED FLEXIBLE TUBING.—E. T. Williams, Duluth, Minn. The flexible tubing is made up of an inner rubber tube surrounded by an outer sheath or covering of a heavy fabric. In the interior of the inner tube there are arranged a number of annular metallic ribs of brass of semi-oval forms in cross section, fastened by tapered rivets.

TRADE NEWS

Trade News of Interest Desired from All of our Readers. Address THE METAL INDUSTRY, 61 Beekman St., New York.

The Trenton Brass and Machine Company, Trenton, N. J., have started to build a three-story brick addition to their plant.

Finished gears, made from McAdamite metal, are a specialty of the McAdamite Foundries Company whose office is at 179 Broadway, New York.

Sidney L. Clarke, 60 First street, San Francisco, Cal., has just issued a 272 page catalogue of his display fixtures, making the fourth edition.

Joseph A. Meyer, maker of tools, dies and molds, of 88 McWhorter street, Newark, N. J., has invented a type casting machine for newspaper work.

The United States Engineer Office, Custom House, Memphis, Tenn., will receive until July 17th sealed proposals in triplicate for furnishing silicon bronze wire.

The New Era Lustre Company, of New Haven, Conn., report that they are doing a brisk business and are selling considerable of their verde antique brand of lacquer.

The Charles Graham Chemical Pottery Works, Brooklyn, N. Y., report that business was never better with them than at the present time. They have a crush of orders.

The Pittsburg Valve and Fittings Company, of Pittsburg, Pa., state that they do not at present expect to enlarge their brass foundry at Barberton, Ohio, as has been reported.

The National Brass and Copper Company, which recently started a rolling mill at Lisbon, Ohio, report that at present they are making a full line of high grade copper sheets.

The Raritan Copper Works report that contrary to the published statement no changes of any nature have been planned for the enlargement of their works at Perth Amboy, N. J.

The F. B. Shuster Company, of New Haven, Conn., have just shipped two of their wire straighteners to Tokio, Japan, and are selling their machinery to other distant parts of the world.

The Robinson Clay Product Company, of New York, with three large factories in Akron, Ohio, announce that the annual output of their glazed stone ware will hold 12,000,000 gallons.

The Scovill Manufacturing Company, of Waterbury, Conn., are erecting a five-story addition to their cutting-up shop, which will be equipped with the latest and best metal working machinery.

Albert A. Moers, who has been connected with E. M. Moers' Sons, has started in business for himself at 412 Grand street, Jersey City, N. J., where he will buy and sell all kinds of metals.

The Wire Goods Company, of Worcester, Mass., who are hardware manufacturers of everything in wire, have had engineers surveying their land with the intention to erect a building in the near future.

A Boston firm which deals in new and old metals, skimmings, drosses and copper bearing material is Goldberg & Rathman, 289 Commercial street. They also manufacture lead, solder, babbitt and type metals.

The Betz Surgical Instrument and Supply Company have moved from Chicago to Hammond, Ind., where they have a model establishment, including a plating plant, for the manufacture of surgical instruments.

Silicon-copper is made by the Electric Smelting & Aluminum Company, of Lockport, N. Y., who are the pioneer manufacturers of this alloy and several others which are used extensively by brass founders.

The International Acheson Graphite Company is to build a factory on the Canadian side of Niagara Falls in order that their Canadian patents may be protected and to meet the Canadian demand for their goods.

The Trenton Hardware Manufacturing Company, of Trenton, N. J., have installed a plating plant, as they will manufacture a line of door locks. The Metal Manufacturers' Supply Company, of Philadelphia, put in the plating apparatus.

The Hanson & Van Winkle Company, whose headquarters are at Newark, N. J., have moved their Chicago store from 30 Canal street to 28 Canal street. Their new store is very complete, having been entirely refitted to meet their growing business.

The Western Brass Manufacturing Works, Chicago, Ill., have increased their stock from $10,000 to $20,000 and their number of directors from three to five. The company also report that they have increased their manufacturing facilities 200 per cent.

Mullin's Patent Flux for use in cleansing and fluxing scrap brass, is sold by The S. Obermayer Company, of Cincinnati, Ohio; price 25 cents per pound. Directions are also furnished by The Obermayer Company regarding the use of this flux.

Manufacturers' low voltage dynamos, everything required for plating and polishing and nickel plating outfits is the announcement of the Zucker & Levett & Loeb Company, of New York. A catalogue giving further particulars is sent free on request.

The Hendey Machine Company, of Torrington, Conn., have awarded the contract for the erection of an additional two-story factory of brick and steel 100 x 214 feet. The company have also placed an order for a ten-ton traveling crane for this building.

The Daily Press reports the award of a contract by the United States War Department of 9,000,000 rounds of ball cartridges between the Winchester Repeating Arms Company, The Union Metallic Cartridge Company and the United States Cartridge Company.

The plant of the Syracuse Metal Company, 714 E. Water Street, Syracuse, N. Y., was damaged by fire to the extent of $2,500; insurance $1,500. The company are taking care of their trade in an adjoining building, and will lose no time in building up again.

The American Graphophone Company, of Bridgeport, Conn., expect to have their new brass foundry ready by the middle of July, when they will make their own brass and aluminum castings. The foundry is 160 x 60 feet and thoroughly modern in equipment.

The Nassau Smelting and Refining Works, of New York City and Staten Island, are extremely busy and report that their business has increased over 50 per cent. since the beginning of the year. They are enlarging their works at Staten Island and New York.

The M. E. Moore Bronze and Plate Company, of Kingston, N. Y., have reorganized under the title of the Colonial Bronze and Silver Company. They are to be incorporated under the laws of the State of New York, have capital in hand to furnish orders in the quickest time, and they will add new patterns to their extensive line.

TRADE NEWS

Trade News of Interest Desired from All of our Readers. Address THE METAL INDUSTRY, 61 Beekman St., New York.

Harvey Hubbell, of Bridgeport, Conn., manufacturer of tapping machines, riveting machines and screw slotting machines used in the manufacture of light metal parts, has incorporated his company for the purpose of making a permanent institution.

The E. W. Bliss Company, of Paris, France, has been organized, with a capital stock of $150,000, by the E. W. Bliss Company, of Brooklyn, N. Y., to take over the management of the Clinchy Works of the company, which are situated near Paris, France.

The Atlanta Iron and Brass Bed Company, of Atlanta, Ga., which was recently incorporated, has completed organization with John L. Coleman, president; W. R. Ware, vice-president, and N. T. Sprate, secretary. The company are putting up a two-story building 100 x 200 feet.

The Frictionless Metal Company announce that they have moved their general office to Chattanooga, Tenn., where they have just built a plant with a daily capacity of 25,000 pounds of frictionless metal. The company also have works at Richmond, Va., and Montreal, Canada.

A specialty of the W. H. Kemp Company, 165 Spring street, New York, is silver for the use of close platers and electroplaters. They also roll aluminum and gauge down to the thinnest. They make special sheets for automobile body makers. They manufacture platers' silver and battery plate 999 fine.

The Werntz and Hubbard Company, of Sterling, Ill., expect to occupy their new factory about August 1st, where they have planned to branch out into flatware and other lines. They have one of the largest and most complete plating plants in Illinois, and it has the title of the Sterling Silver Plating Company.

The Acme Metal Company, of Fort Worth, Texas, manufacturers of solder, babbitt metals, etc., have decided to put in a machine shop for repairing automobiles. They report that they have one of the largest and most complete copper and nickel plating plants in Texas and are now prepared to cast, finish and plate metals.

"A Lye that's not a Lie!" is the announcement of the circular of the United Zinc and Chemical Company, who are putting on the market for platers' use UZ Purity Lye, which they say is the strongest and purest lye sold. Further particulars may be obtained from the United Zinc and Chemical Company, of Chicago, Ill.

The J. E. Bolles Iron and Wire Works, of Detroit, Mich., have recently completed a fine bronze grill work for the Citizens' Banking & Trust Company, of Sandusky, Ohio. The company is putting in various kinds of bronze fittings, one other job being for a Detroit apartment house, largest west of New York City.

The Bishop & Babcock Company, of Cleveland, Ohio, and other plants in their vicinity have been bothered recently by thieves who have had a liking for copper and brass. Their night watchman recently captured some of the thieves and it is now believed that when the courts are through with them they will work for their living in jail.

George G. Prentice & Co., of New Haven, Conn., have bought the factory of the Ready Bits Company, of the same city, which will give them six times the floor space that they had in their old shop. The new plant is being equipped with machinery as it is needed. The firm make screw and turret machinery for automatically finishing metals.

C. W. Moore, of Bridgeport, Conn., has moved into his new and larger quarters across the street from his old place of business at the corner of East Washington and Housatonic avenues. Mr. Moore is in the market for brass skimmings and grindings. Any one having this material for sale can secure his immediate attention by dropping him a postal.

The Marshalltown Aluminum and Brass Foundry Company, of Marshalltown, Iowa, with a capital of $5,000, have recently been incorporated and are making a specialty of aluminum castings, letters and figures for house doors, name plates and business signs. They are associated with the Lennox Machine Company and Williams Brothers of the same city.

At the convention of the American Foundrymen's Association, held in New York City, the Brown Specialty Machinery Company, of Chicago, Ill., handed out samples of cores made by the Hammer Core Machine, and which machines are sold exclusively in New England, New York and New Jersey by Thomas W. Pangborn Company, 42 Dey Street, New York City.

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 A. M., July 18th, for copper, brass wire, brass pipe, fittings, valves and other machinery, metals and supplies furnished by the non-ferrous metal industry and kindred interests. At the Mare Island Navy Yard, California, there will be sold on July 18th ash waste from the brass foundry and other scrap material.

Buyers of crucibles have a fine assortment of makers to select from in the advertising pages of THE METAL INDUSTRY. Among the different makes represented are the following: J. H. Gautier & Co., McCullough-Dalzell Crucible Company, Ross-Tacony Crucible Company, Robert J. Taylor, Inc.; R. B. Seidel, Inc.; Joseph Dixon Crucible Company, and the Taunton Crucible Company, all of which make excellent crucibles.

The Waterbury Crucible Company, of Waterbury, Conn., is making some bottom pouring crucibles for use in melting silver. By a tube which leads from the top to the bottom the metal is drawn from the base of the pot instead of the top. This form of crucible was described and illustrated in the April issue, 1903, of THE METAL INDUSTRY. For the brass foundry trade the Waterbury Works are making crucibles as large as No. 300.

We have received word from the Atlan Copper and Brass Company, of Pittsburg, Pa., that their new rolling mill will be located in the Pittsburg district within a radius of 40 miles of Pittsburg, which will give the mill the Pittsburg Railroad rates to all points North, East, South or West. The announcement of the incorporation of the Atlan Copper and Brass Company and other particulars were mentioned in the June number of THE METAL INDUSTRY.

The Hudson Rolling Mill Company, of Bloomfield, N. J., have taken up the manufacture of an alloy which they call "Signal Metal," which they state is a nickel hardened deoxidized babbitt. In support of their claim of "Signal Metal" the company have just issued a very interesting booklet on bearing metals. Some of the facts that are stated about "Signal Metal" are that it is of German origin and that its specific gravity is 7.95.

During the past five years the Light Manufacturing and Foundry Company, of Pottstown, Pa., have experimented and perfected their automobile brand of aluminum castings until they have convinced the users that they are all that the manufacturers claim. Besides aluminum castings of all kinds and shapes, the company manufacture phosphor bronze bearing metals, phosphor bronze gearing metals and brass and bronze castings generally for high class machine work.

TRADE NEWS

Trade News of Interest Desired from All our Readers. Address THE METAL INDUSTRY, 61 Beekman St., New York.

The Ajax Metal Company, Limited, with a capital stock of $50,000, has been incorporated at Ottawa, Canada, to manufacture various metal alloys under patents controlled by the Ajax Metal Company, of Philadelphia, Pa. The Canadian Company is composed largely of Montreal men and it is their intention to make a full line of alloys, car and engine bearings, etc. They have been in operation for a short time past and are in a position to handle orders of any description.

D. J. Renaud, the owner of the Renaud Brass Foundry, of Carthage, N. Y., has formed a partnership with his son, Fred Renaud, and the firm will hereafter be known as D. J. Renaud & Son. The capital of the business has been considerably increased and the business is in a flourishing condition. Besides castings the firm manufacture the Gardner shaftliner, which is put on the market by the Coffeen & Hall Company, of Carthage. Renaud & Son also have a nickel plating plant.

Owing to the rapidly increasing demand for their iron lined brass and bronze tubes, the Phoenix Tube Company, Brooklyn, N. Y., announce that they have found their present factory facilities inadequate and have completed arrangements for doubling the capacity of their present plant. They expect to finish the work by the 15th of July. Their tubing is manufactured specially for use in making metal furniture and is made in three grades: brazed, lock joint and close joint, all lined with high grade steel.

The Waterbury Manufacturing Company, of Waterbury, Conn., report that the new addition to their factory building, 200 x 50 feet, is well under way, the foundry being half finished, and they expect in two more months to move into it. The building will be used also as a cutting-up shop. The foundry will be on the sixth floor. The company have also decided to carry up one of their factory buildings 10 feet, making an additional story. The company have been very busy for a number of months running day and night.

Frederick Bertuch & Co., Room 907, Temple Court Building, New York City, are general agents for the extensive German stoneware factory of Friedrichfeld, Baden, which is said to be the largest individual plant in Germany for the manufacture of chemical stoneware. This ware is used in the chemical and metal industries, and Frederick Bertuch & Co. carry a well assorted stock of these goods. Among them may be mentioned stoneware tanks of every description, dipping baskets and jars suitable for platers and metal workers. Firms which need this high grade stoneware will be pleased to learn where they can obtain them.

The Hays Manufacturing Company, of Erie, Pa., are erecting two additional buildings, which they hope to have finished by November 1st. One a machine shop 150 x 160 feet, two stories high, and a foundry 60 x 98 feet, a portion of this to be two stories. The company believe that these two new buildings will enable them to take care of their increasing trade and thereby give them a better location for a growth in the future. The new buildings will increase their capacity 50 per cent and will be located adjoining the railroad tracks. They manufacture water and gas specialties.

The Miller Lock Company, of Frankford, Philadelphia, Pa., have just issued a very attractive catalogue showing their line of locks. A feature of the catalogue is the illustration and description of their patent standard lithographic padlock card assortments, which consist of one dozen locks each mounted on every cardboard and by which arrangement the keys can be unhooked and used to remove or replace the locks. Each lock covers its own picture. The picture identifies the lock and ornaments the card after the lock has been removed. Further particulars may be obtained from the company.

A new style of crucible lifter by which the crucible may be easily lifted from the furnace is shown in our advertising pages. It is not expensive, and it can readily be applied in any foundry. Further particulars may be secured from the manufacturers, the J. D. Smith Foundry Supply Company, of Cleveland, Ohio, who sell foundry supplies. Another one of their specialties are patented perfection core boxes for making accurate straight round cores from ½ inch to 6½ inches in diameter and any length desired. The box has no dowel pins to break off, and it is claimed by the makers to be the most durable and accurate box made.

The Hofeller-Brooks Aluminum Brass Foundry Company has been organized at Detroit, Mich. The company is a branch of Theodore Hofeller & Co., Buffalo, N. Y., makers of automobile castings. The Buffalo Company found that they could take better care of their Detroit trade by being on the ground, thereby giving quick deliveries, which they believe to be the kynote to success in the aluminum and brass foundry business. In their foundry they have one equipped with the latest improvements and expect to make their automobile department in aluminum and bronze castings as successful as it has been in their Buffalo foundry. Besides aluminum and bronze automobile work they will do a jobbing trade.

The Roe Stephens Manufacturing Company, of Detroit, Mich., announce that they have bought from C. W. Thomas the plant, equipment and business of the late Michigan Brass and Iron Works of Detroit. The Roe Stevens plant will be devoted to the manufacture of Scott pop safety valves, Goldsmith throttle valves, Scott gate vales, angle, globe and check valves and steam specialties. The Michigan plant will continue to manufacture a full line of fire hydrants, valve boxes, indicator posts, foot valves, air and relief valves, etc. With their greatly increased facilities the company announce that they can furnish goods very promptly. The officers of the Roe Stephens Manufacturing Company are: C. W. Thomas, president; T. P. Stephens, secretary, and Wm. Scott, superintendent.

PERSONAL

The Waterbury Buckle Company, of Waterbury, Conn., has secured the services of Charles Webb as assistant superintendent.

U. S. Consul Marshal Halstead, of Birmingham, England, reports that a Birmingham firm is desirous of taking up an agency for a patented novelty in brass goods.

H. J. Hawkins, 6817 Champlain avenue, Chicago, Ill., makes a specialty of getting platers out of trouble. He has had a good many years' experience on plating in all of its branches, and furnishes expert advice.

W. A. Stadelman, Eastern agent of The Wellman-Seaver-Morgan Company, and who has been in charge of the Eastern office at No. 42 Broadway, New York City, has been appointed General Sales Agent of the same company, with headquarters at Cleveland, Ohio, taking effect July 1st. Fred Stadelman has been appointed assistant manager of the New York office of The Wellman-Seaver-Morgan Company. Harry V. Croll, M. E., has accepted a position with the Wellman-Seaver-Morgan Company, of Cleveland, Ohio.

MEETINGS

In accordance with the recommendation of the directors some time ago, the stockholders of the National Lead Company, at a special meeting, held in Jersey City, June 26, voted to increase the company's preferred stock from $15,000,000 to $25,000,000, and to increase the common stock also from $15,000,000 to $25,000,000. Articles of incorporation were amended accordingly. It has generally become understood that the increase in capitalization is preliminary to the proposed merger of the United Lead Company with the National Lead Company. At the meeting 212,000 out of 300,000 shares were represented.

TRADE NEWS

Trade News of Interest Desired from All our Readers. Address THE METAL INDUSTRY, 61 Beekman St., New York.

OBITUARY NOTES

Louis Lelong, who for many years was head of the metal refining firm of L. Lelong & Brother, died at his home in Newark, N. J., on June 14th. Mr. Lelong early became interested in metallurgy and late in the fifties went to Newark, where he established at Marshall and Halsey streets the business which now bears his name and which will be continued by Dr. Lelong and Charles J. Degavre, the remaining partners.

Charles Benisch, a metal dealer for many years at Newark, N. J., died in that city on June 9th. He was 57 years of age.

METAL MARKET REVIEW

COPPER.—The price of standard copper in London has held very steady, opening at £65 7s. 6d. Prices advanced to £66 5s., and at the close spot is quoted at £65 15s., showing a net advance for the month of about 5s.

In the New York market the strong feature has been the strong statistical position of the metal and the scarcity of spot and nearby supplies. The demand from abroad has not been quite as pressing as the last few months, and it is predicted that the East is not likely to be an active buyer again. The exports for the month are 20,112 tons, against 16,279 the same month a year ago, making total exports for the first half of 1905, 127,817, against 114,044 for same period of 1904. The home demand has been good and some large contracts have been filled for August and September deliveries. Prices for standard brands have not varied. At times a slight premium has been paid for spot copper, and some few lots have come on the market for resale. Lake, 15⅛@15¼c.; electrolytic, 15@15⅛c., and casting brands, 14¾@15c., according to brand and grade.

TIN.—Spot tin opened June 1 at £136 7s. 6d., and with heavy trading steadily advanced to £140 on the 28th, and the close prices are a shade lower, closing at £139 12s. 6d., showing a net advance for the month of £3 5s.

In the New York market prices have followed the movement of the bulls in London. Statistically the position of tin is very strong. Spot tin has been scarce and in strong hands, and with small supplies coming to America from the Straits we have had to make purchases in the London market at the ruling high prices. Consumers realize that £139 is abnormally high, and are buying only for the immediate necessities. Prices here opened at 29⅞c. and sold up to 30¾c., closing a little below the highest at 30.60 for 10-ton lots and 30.70 for smaller lots.

LEAD.—The London market has advanced during the month from £12 17s. 6d. to £13 8s. 9d. at the close. The leading interest in lead has made no change in price, and until more lead comes on the market or the tariff is reduced the market is entirely controlled by the Trust. Spot lead in New York is quotable at 4.50 to 4.60, shipment lead at 4.50 New York.

SPELTER.—The foreign spelter market opened at £23 12s. 6d., and advanced to £24 5s., and closes at £23 17s. 6d.

The New York market for spelter has been considerably firmer and more active and prices have advanced fully ¼ cent from the early part of the month. At the close the market is a shade easier at 5.25 for prompt shipment spelter.

SILVER.—The London silver market has ruled dull and prices have not much changed, opening at £26 9s. 16d. on the 1st. Prices advanced to £27⅛, on the 21st and closes at £26 15s. 16d.

In the New York market prices have each day followed the fluctuation in London, opening at 57¾c., advancing to 58¾c. and closing at 58½c.

OLD METALS.—The market for old metals has been dull and very few changes to report. Zinc dross has been the one exception, and with the advance in the foreign market for spelter to £24 5s. the export demand has increased, and prices are advanced from a shade below 4s. f. o. b. to 4¼c. asked to-day. Good heavy copper is in fair demand at 14c.

TRADE WANTS

ANSWERS SENT IN OUR CARE WILL BE FORWARDED.

FOR SALE—A 20-inch diameter by 36-inch face, extra heavy rolling mill, all complete for rolling hot or cold metals. Also a complete annealing furnace. Address ROLLING MILL, care THE METAL INDUSTRY.

WANTED—A Superintendent for a small plant making aluminum cooking utensils and specialties. Must be thoroughly practical. State age, experience and salary expected. Address Lock Box 635, Uhrichsville, Ohio.

POSITION desired as Foreman by a first-class Chandelier and Pattern Maker with 25 years' experience. I am well acquainted with modern antique work and finish. Address CHANDELIER FOREMAN, care THE METAL INDUSTRY.

CORE MAKER FOREMAN WANTED—First-class man who is capable of getting out cores at minimum cost. The work is structural and ornamental iron and bronze. State salary wanted, ability, etc. Address CORE MAKER FOREMAN, care THE METAL INDUSTRY.

WANTED—Machine for polishing tubing. Address MACHINERY, care THE METAL INDUSTRY.

PLATER, CHEMIST and ETCHER desires position. Understands all finishes, and is capable of taking care of any shop. Address P. C. E., care THE METAL INDUSTRY.

MANUFACTURER'S AGENT—I desire to represent in Reading, Pa., and vicinity the manufacturers of metals, supplies and machinery for brass and iron foundries and factories. I have a wide acquaintance among the manufacturers of this section. Full particulars and references cheerfully furnished. H. E. HARBSTER, Reading, Pa.

WANTED—A SALESMAN to sell crucibles in Chicago and vicinity. Address CRUCIBLE, care THE METAL INDUSTRY.

A PARTY WITH $2,000 can learn of a good opportunity to enter the plating business in a shop which has been established six years in a good western city. Experience is more essential than money. Address, OPPORTUNITY, care of THE METAL INDUSTRY.

FOR SALE. Several valuable patents for grinding, scouring and plating all kinds of metal. For further particulars address, THE METAL INDUSTRY.

PLATER with 8 years' experience desires to take charge of a shop. Has a thorough knowledge of all the finishes in electro, matt, antique, and immersion. Address WM. MCDERMOTT, 173 Ten Eyck Street, Brooklyn, N. Y.

ALUMINUM PLATING. We have mastered the art of plating aluminum with silver, gold, copper, gun metal and any other finish desired. We are prepared to make contracts for plating any metal on aluminum. Address the ALUMINUM PLATING COMPANY, 182 West Houston Street, New York City.

WANTED—A SALESMAN, who visits plating concerns, to sell a chemical as a side line. Address, with full particulars, HUSTLER, care THE METAL INDUSTRY.

WANTED—A FOREMAN in BRASS FOUNDRY. One familiar with mixtures and machine molding and competent to handle men properly; non-union. None others need apply. Address, with references, FOUNDRY FOREMAN, care THE METAL INDUSTRY.

INFORMATION BUREAU

Subscribers intending to purchase metals, machinery and supplies and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY. Our Information Bureau is for the purpose of answering questions of all kinds. Send for circular.

Metal Prices, July 5, 1905

METALS

	Price per lb.
TIN—Duty Free.	
Straits of Malacca	31.00
COPPER, PIG, BAR AND INGOT AND OLD COPPER—Duty Free. Manufactured 2½c. per lb.	
Lake	15.25
Electrolytic	15.15
Casting	14.75
SPELTER—Duty 1½c. per lb.	
Western	5.30
LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.50
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Hallets	12.50 to 14.00
Cooksons	12.50 to 13.00
Other	12.25 to 12.50
NICKEL—Duty 6c. per lb.	
Large lots	45 to 50
Small lots	50 to 75
BISMUTH—Duty Free	$1.50 to $2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
	Price per oz.
SILVER—Duty Free—Commercial Bars	$0.58½
PLATINUM—Duty Free	20.50
GOLD—Duty Free	20.67
QUICKSILVER—Duty 7c. per lb. Price per Flask	40.00

Zinc—Duty, Sheet, 2c. per lb. 600-lb. casks, 7.50 per lb., open, 8.00 per lb.

Tobin Bronze—Rods, Unfinished, 19c.

Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Manganese Bronze, Ingots	16 to 17c.
Phosphor Bronze, Ingots	16 to 20c.
Silicon-Copper, Ingots	32 to 36c.

OLD METALS

Heavy Cut Copper	12.50c.	13.00c.
Copper Wire	12.50c.	12.75c.
Light Copper	11.00c.	11.25c.
Heavy Mach. Comp	11.00c.	11.50c.
Heavy Brass	8.00c.	8.25c.
Light Brass	6.75c.	7.00c.
No. 1 Yellow Brass Turnings	7.50c.	8.25c.
No. 1 Comp. Turnings	9.00c.	9.50c.
Heavy Lead	4.00c.	4.25c.
Zinc Scrap	4.00c.	4.25c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	12.00c.	18.00c.
Old Nickel	15.00c.	25.00c.
No. 1 Pewter	20.00c.	21.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins.	Not longer than 72 ins.	19	19	19	19	19	20
	Longer than 72 ins. Not longer than 96 ins.	19	19	19	19	19	20
	Longer than 96 ins.	19	19	19	19	19	21
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	19	19	19	19	19	21
	Longer than 72 ins. Not longer than 96 ins.	19	19	19	19	19	21
	Longer than 96 ins. Not longer than 120 ins.	19	19	19	19	20	22
	Longer than 120 ins	19	19	19	20	21	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	19	19	19	20	21	23
	Longer than 72 ins. Not longer than 96 ins.	19	19	19	20	22	24
	Longer than 96 ins. Not longer than 120 ins.	19	19	19	21	23	27
	Longer than 120 ins.	19	19	20	22	25	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	19	19	19	20	22	25
	Longer than 72 ins. Not longer than 96 ins.	19	19	19	21	23	28
	Longer than 96 ins. Not longer than 120 ins.	19	19	20	22	25	
	Longer than 120 ins	20	20	21	23	27	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	19	19	20	22	27	
	Longer than 96 ins. Not longer than 120 ins.	19	19	21	24	29	
	Longer than 120 ins.	20	20	22	27		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	20	20	22	25		
	Longer than 96 ins. Not longer than 120 ins.	21	21	23	26		
	Longer than 120 ins.	22	22	24	28		
Wider than 108 ins.	Not longer than 132 ins.	23	23	25			
	Longer than 132 ins.	24	24	27			

Rolled Round Copper, ⅜ inch diameter or over, 19 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, July 5, 1905

Net Cash Prices.

COPPER BOTTOMS, PITS AND FLATS.

14 oz. to square foot, and heavier, per lb..... 23c.
Lighter than 10 oz..... 29c.
10 oz. and up to 12 oz..... 26c.
12 oz. and up to 14 oz. to square foot, per lb..... 24c.
Circles less than 8 in. diam., 2c. per lb. additional.
Circles over 13 in. diam. are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order.
Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.32	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26.....	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28.....	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, inc	$0.23	$0.27	$0.28
Above No. 10 to No. 16	.23½	.27½	.28½
Nos. 17 and 18	.24	.28	.29
" 19 and 20	.25	.29	.33
No. 21	.26	.30	.34
" 22	.27	.31	.35
" 23	.28	.32	.36
" 24	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 30 per cent.

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ in. to 8½ in. O. D. Nos. 4 to 13 Stubs Gauge, 20c. per lb.
Seamless Copper Tubing, 23c. per lb.
For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb	28	27	22	21	20	20	20	20	20	20	20	21	22	24	26	27

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

Plain	Round	Tube,	¾	in.	up	to	2	in.,	to	No.	19,	inc.	Per lb $0 35
"	"	"	⅝	"	"		¾	"		"	19,	"	36
"	"	"	½	"	"		⅝	"		"	19,	"	38
"	"	"	⅜	"	"		½	"		"	19,	"	41
"	"	"	¼	"	"		⅜	"		"	19,	"	48
"	"	"	⅛	"	"		¼	"		"	19,	"	65
"	"	"	¼	"	"		⅛	"		"	19,	"	1 00
"	"	"	⅛	"	"		¼	"		"	19,	"	1 50

Smaller than ¼ inch.....Special
2 inch to 3 inch, to No. 19, inclusive..... 38
3 inch..... 40
Over 3 inch to 3½ inch..... 45
Over 3½ inch..... 50

Bronze and copper advance 3 cents. Discount 35 per cent.

PRICE LIST FOR SHEET ALUMINUM—B. & S. Gauge.

Wider than and including	*3 in. 12 in. in coils.	6 in. 14 in.	14 in. 16 in.	16 in. 18 in.	18 in. 20 in.	20 in. 24 in.	24 in. 30 in.	30 in. 36 in.	36 in. 40 in	Cutting to Length.	Polishing or Satin Finishing One side.
No. 13	42	42	44	44	44	44	47	47	47	1	2
" 14	42	42	44	44	44	44	47	47	47	1	2
" 15	42	42	44	44	44	44	47	47	47	1	2
" 16	42	42	44	44	44	44	47	47	47	1	2
" 17	42	42	44	44	44	44	47	47	47	1	3
" 18	42	42	44	44	44	44	47	47	50	1	3
" 19	42	42	44	44	44	44	47	48	51	1	4
" 20	42	44	44	44	44	46	49	50	52	1	4
" 21	42	46	46	46	46	48	51	52	58	2	5
" 22	42	46	46	46	48	48	51	55	59	2	5
" 23	42	46	46	46	48	48	51	57	60	2	6
" 24	42	46	48	50	50	50	53	59	62	2	6
" 25	44	47	49	51	51	51	54	61	65	2	7
" 26	44	47	50	54	54	54	59	63	69	2	8
" 27	44	48	52	56	56	57	62	66	72	2	10
" 28	44	48	54	56	57	57	64	70	75	2	11
" 29	46	49	56	58	60	60	69	75	80	2	13
" 30	46	50	58	60	64	70	77	80	85	2	15
" 31	48	52	60	63	68	76	79	82	88	3	17
" 32	50	54	62	66	74	82	89	95	100	3	19
" 33	52	56	65	70	78	89	96	05	115	3	21
" 34	55	60	67	75	83	96	108	115	125	3	25
" 35	.....	70	75	85	95	105	120	130	.....	.....	Polished or Scratch
" 36	.....	85	95	105	120	125	140	.....	.....	.....	Brushed 2 sides double above prices.
" 37	.....	100	110	125	140	155	170	.....	.....	.....	
" 38	.....	120	135	150	165	180	200	.....	.....	.....	
" 39	.....	140	160	180	200	220	.....	.....	.....	.....	
" 40	.....	170	200	220	240	.....	.....	.....	.....	.....	

In flat rolled sheets the above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheeet. All columns except the first refer to flat rolled sheet. Prices are for 50 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

Discounts as Follows are Given for Sheet Orders Over 200 Pounds.

200 to 1,000 pounds.....10 per cent. off list.
1,000 to 2,000 " 10 per cent. and 2 " "
2,000 to 4,000 " 10 " " 3 " "
4,000 pounds and over 10 " " 5 " "

PRICE LIST OF SEAMLESS ALUMINUM TUBING—STUBS' GAUGE.

STUBS' G.	1-4"	3-8"	1-2"	5-8"	3-4"	1"	1 1-2"	2"	2 1-2"	2 3-4"
4 to 11	.....	.....	96	86	83	77	67	61	61	61
12	.....	1 08	96	86	83	77	67	61	61	61
13	.....	1 08	96	86	83	77	67	64	64	64
14	.....	1 08	96	86	83	77	67	64	64	64
15	.....	1 12	96	89	86	80	70	67	67	67
16	.....	1 15	99	93	89	83	70	70	70	70
17	.....	1 18	1 02	96	93	86	73	73	73	73
18	1 85	1 24	1 05	99	93	86	77	77	77	80
19	1 88	1 28	1 08	1 02	99	93	83	80	80	83
20	1 95	1 31	1 15	1 08	1 05	99	89	86	86	89
21	2 01	1 37	1 21	1 15	1 12	1 05	99	93	93	96
22	2 17	1 44	1 24	1 18	1 15	1 08	1 05	99	1 05	1 05
23	2 34	1 50	1 31	1 24	1 21	1 15	1 15	1 08	1 15	1 15
24	2 48	1 60	1 37	1 31	1 28	1 18	1 21	1 21	1 24	.....
25	2 65	1 69	1 47	1 37	1 34	1 28	1 34	.....	.....	.....

Prices are for lots of 50 lbs. Boxing extra. Smaller, larger and intermediate sizes furnished by manufacturers.

Discounts as Follows are Given for Tube Orders Over 50 Pounds.

50 to 200 lbs..... 5 per cent. discount off list
200 to 2,000 lbs.....10 " " " " "
2,000 to 4,000 lbs.....10 and 3 " " " " "
4,000 lbs. and over.....10 and 5 " " " " "

PRICE LIST FOR ALUMINUM ROD AND WIRE—B. & S. GAUGE.

Diameter B.& S.G'ge.	0000 to No. 10	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38½	38½	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 53

200 lbs. to 30,000 lbs., 3 cents off list; 30,000 lbs. and over, 4 cents off list.

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive, American or Brown & Srape's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50 per cent.